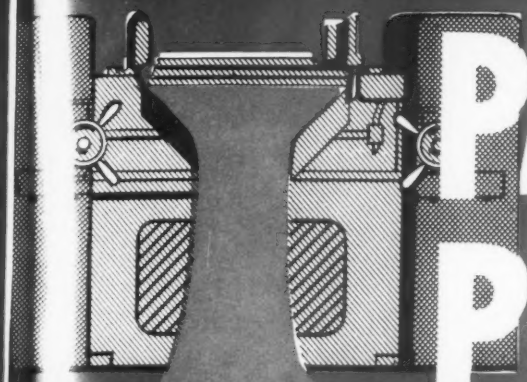

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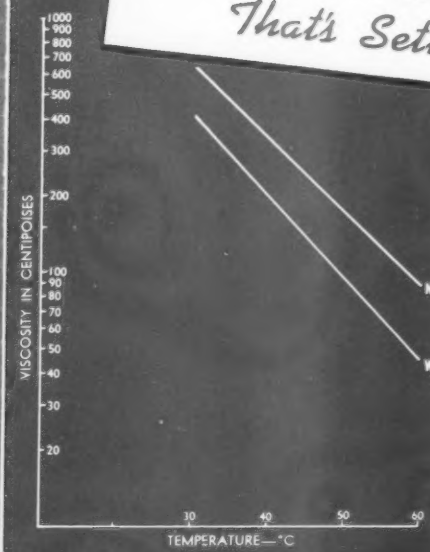

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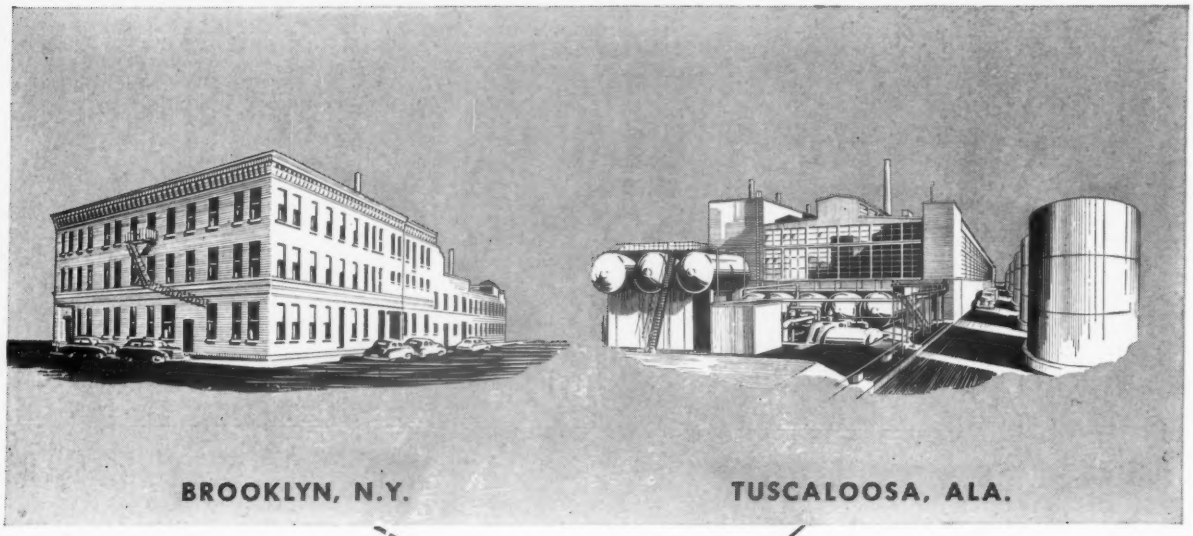

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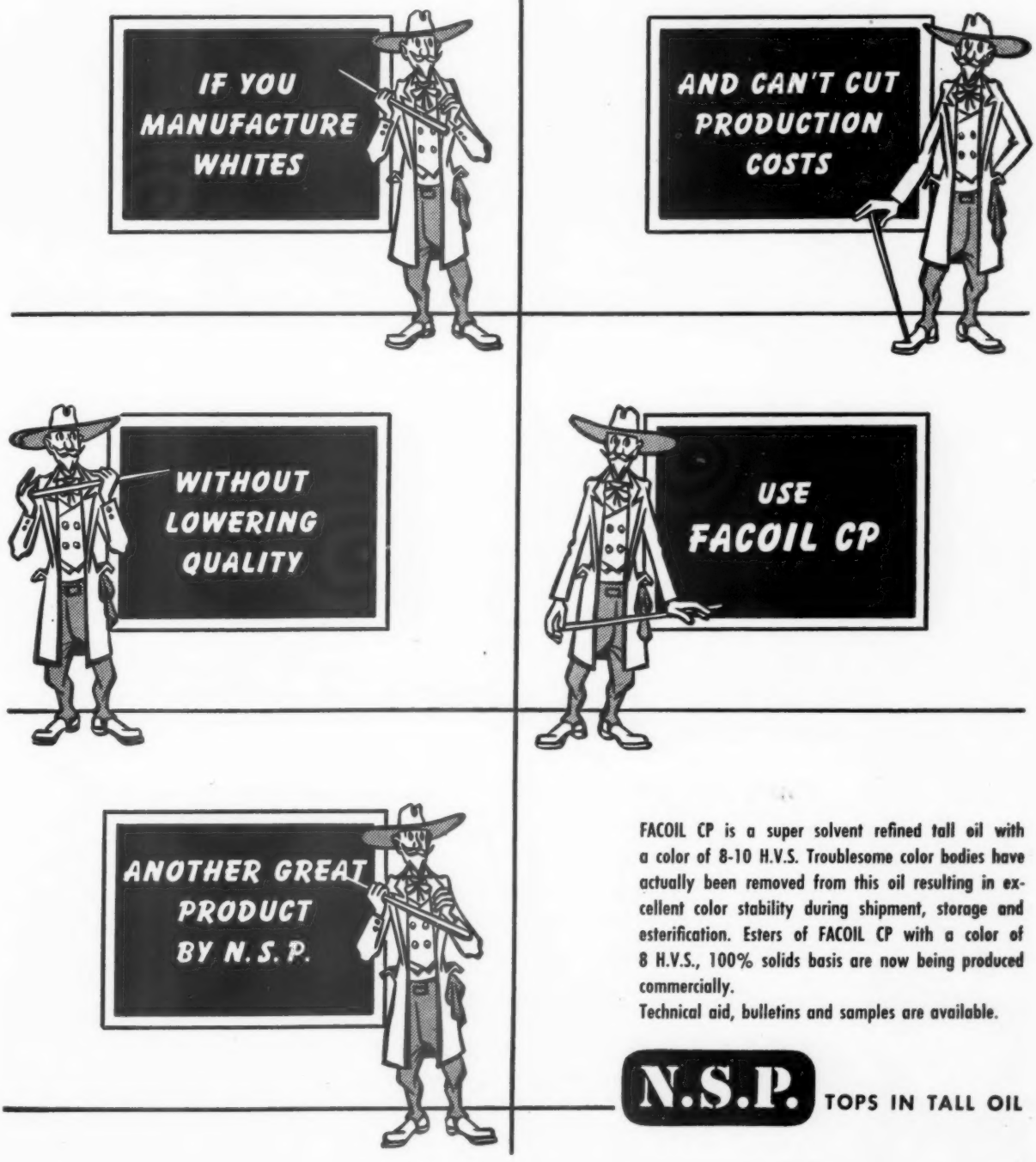
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NEXT ISSUE

About three years ago, the Australian Defense Laboratories announced the discovery of esters of Titanium. Preliminary experiments revealed that these esters had considerable possibilities, and in particular, the butyl types offered some interesting properties as a paint vehicles. In this connection we are scheduling a very informative article on alkyl Titanates in general, and their possibilities in the coating field for the benefit of those actively engaged in work on this material. The article was prepared by Dr. Max Kronstein of New York University.

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Editorial Comment

Titanium Supplies

AGAIN paint manufacturers are confronted with a serious shortage of titanium pigments. Many plants are now on allocation, and indications are that this situation will exist for some time.

Since the paper, ceramic, plastic, rubber, and more recently, the titanium metals industries have been consuming more and more titanium dioxide, paint manufacturers have to be satisfied with limited quantities of this all important pigment. Perhaps, the most influencing factor in bringing about the present critical situation was the closing of a medium-size titanium-producing plant last fall. This resulted in a considerable loss of titanium dioxide to the paint industry.

Another contributing factor is the great demands of consumers for interior and exterior whites. This has caused paint manufacturers to increase production of titanium-based paints. In this connection, it is interesting to note that paint manufacturers are consuming more and more of titanium-calcium pigments for this purpose. These are cheaper than straight titanium dioxide and possess adequate hiding so that they may be satisfactorily used in general house paints.

Meanwhile, paint manufacturers must be satisfied with limited supplies, and turn to other types of white pigments to meet their requirements. However, with all titanium plants working at full capacities, there is a good possibiltiy that adequate supply of this important raw material will be available in the fall.

Benzene Pinch

RECENT shortages of benzene have created a serious situation in many synthetic chemical industries. Those mostly affected are the rubber, plastic, and resin industries.

The tight supply of this important raw material can be directly attributed to the 1949 coal strike—benzene is obtained almost entirely from coke oven operations. However, of more importance is the general upswing in the production of plastic materials, which requires tremendous amounts of benzene for their production.

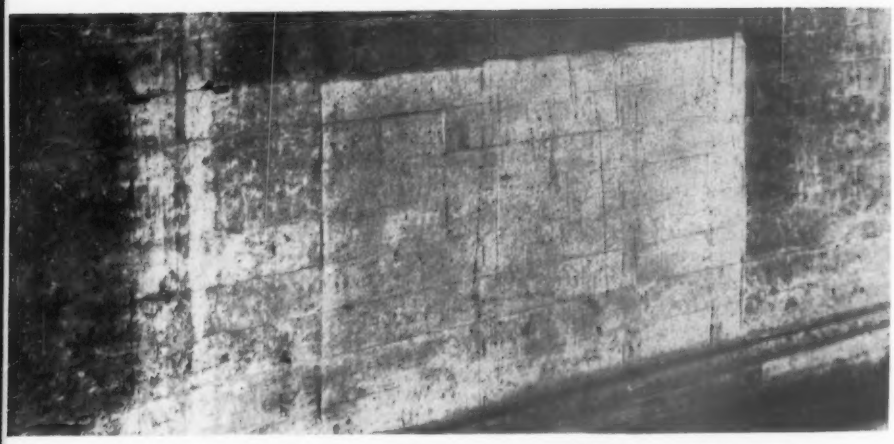
It is estimated that benzene from coke will amount to about 165 million gallons this year as compared to 185 million gallons—a normal annual production. The chemical industry alone consumes some 150 million gallons a year. The biggest users are synthetic rubber and resin industries. Styrene which is an important raw material in synthetic rubber requires some 50 million gallons of benzene for its annual production. Next is phenol which absorbs some 35 million gallons. Phenol is a basic ingredient in the manufacture of phenolic resins.

This situation is a good example of the interdependence of many essential chemical industries on one raw material produced in most part from one process—namely coke oven operations. The paint industry no doubt will feel a pinch in such raw materials as polystyrene, phenolics and synthetic rubber compounds.

In order to alleviate the shortage, production of benzene from petroleum has been stepped up. Chemical companies have had enough of coal strikes and unsteady supplies of benzene. They are turning toward petroleum producers. However, any real production from petroleum is not anticipated until 1952. Pan American Refining Corp., a leading producer of petroleum-based benzene, has predicted that it will sell all the benzene it can produce this year. This company is currently selling benzene between 35 and 40 cents a gallon on contract basis. Since foreign imports are not heavy and since prices of the imported product are high, no real help can be expected from this source.

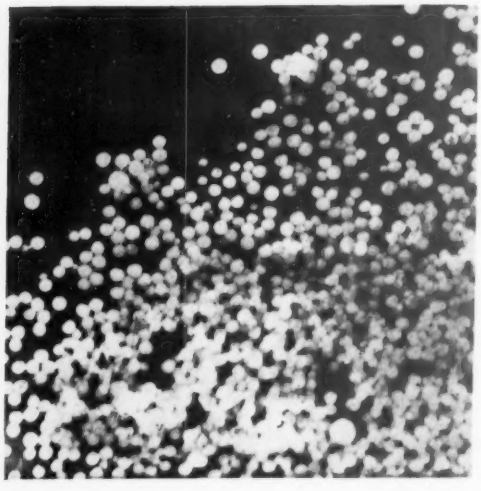
However, with the present tight situation of benzene, it can be expected that important price changes will take place in some of the basic resins used in the manufacture of paint, ultimately affecting the price of the packaged paint product.

Here, styrene emulsion coating is being applied by spraying to exterior concrete and cinder blocks.



Coating of polystyrene emulsions applied to sandblasted area of bridge abutment. These coatings were applied in Sept. 1944 and inspected per this photo in Aug. 1948.

polystyrene emulsions



Electron micrograph shows uniformity and particle size of polystyrene emulsions. Particles are about 0.1 micron in diameter.

By
K. V. McCULLOUGH
Development Department
Bakelite Division
Union Carbide and Carbon Corporation

POLYSTYRENE has become an extremely important member of the plastics family, particularly in the molding field where it is estimated that 184,000,000 pounds were sold last year. The polystyrene molding materials were first manufactured in this country as recently as 1937 so its rate of adoption as one of the most important plastics has been phenomenal. The inherent properties of the material such as: clarity; pale color; excellent color retention; low degree of water absorption; resistance to acids, alkalies and other chemicals; desirable electrical insulating properties; dimensional stability; and, low cost, account for its widespread usage. It is only within the past two or three years, however, that methods have been found to make practical use of these good properties in coating materials. The most important of these methods at present are: (a) the use of water dispersions of polystyrene or copolymers containing styrene as one of the important ingredients; and (b) the use of copolymers of styrene with drying oils or with oil-modified resins of the alkyd family. This discussion will cover some of the properties of resins of the dispersion type.

Polystyrene Emulsions

DURING the past few years, particularly since the war, there has been an increasing trend in the coatings field toward the use of resins of higher and higher molecular weight. Molecular dispersions (solutions) of polymers of high molecular weight in solvents are impractical for most uses since their viscosities are so high. A solution of molding grade polystyrene, for example, must be reduced to about 5–10% solids for application by the common methods and this results in extremely thin films and high solvent loss. Furthermore, spray application of such solutions is extremely difficult and sometimes impossible. Other polymers of high molecular weight such as the polyvinyl chloride-acetates, acrylates, and others exhibit a similar behavior pattern, and even more expensive solvents are required.

Fortunately, it has been found possible to prepare practical dispersions of these high polymers in solvents, plasticizers, or water which may be easily applied by conventional methods at high solids contents and at lower cost. The oil-modified phenolic dispersions resins were the pioneers in this field, followed by dispersions of vinyl copolymers in plasticizers, or lean solvent mixtures. More recently the coatings formulator has been offered dispersions in water of polystyrene, polyvinyl acetate and polyvinyl copolymers, polyvinylidene chloride resins, polyacrylates, styrene-butadiene copolymers, and others.

"Bakelite" polystyrene emulsions are members of this class, and, at the outset it might well be pointed out that the term "emulsion" is not strictly accurate in describing these dispersions. An emulsion is usually defined as a dispersion of minute droplets of a liquid in another liquid. The dispersed phase in the products to be discussed here is a solid (polystyrene) having a molecular weight of over 150,000. However, the terminology is of little practical consequence since in particle size and general properties these products behave like emulsions and since the term has become established in the trade it will be used in this discussion. The electron microscope reveals that the polystyrene particles in these emulsions are little spheres, most of which have a diameter of approximately 0.1 micron or, roughly, four millionths of an inch (0.000004 inch). A few random particles are approximately 0.2 micron in diameter. The dispersed phase in most emulsions is said to fall in the approximate range of 0.25 to 25 microns in diameter.

"Bakelite" polystyrene emulsions are prepared with anionic emulsifiers which readily volatilize at room temperature or at elevated temperatures so that films of these products quickly develop a high degree of water resistance. To put it another way, they do not re-emulsify. These emulsions also contain stabilizers which permit them to stand the mechanical abuse encountered in pigmentation, pumping, and application by brushing or roller coating machines.

Number	Type	N.V. Content
"Bakelite" BKS–90	Unplasticized	30–33%
" BKS–92	Plasticized	37–40%

No.	pH	Specific Gravity	Viscosity
BKS–90	8.9–9.9	1.015–1.025	Less than 150 cps.
BKS–92	8.5–9.5	1.020–1.040	2000–5000 cps.

TABLE I

Material Tested	Modifier**	Specific Permeability***
* Molding Grade Polystyrene	None	1.21
BKS-92, Plasticized Polystyrene Emulsion	"	0.86
BKS-92, Plasticized Polystyrene Emulsion	5 parts wax	0.21
BKS-92, Plasticized Polystyrene Emulsion	7½ " "	0.14
* Vinyl Chloride-Vinyl Acetate Copolymer	None	0.20
* 12½-gallon Phenolic-Tung Oil Varnish	"	0.32

* Films deposited from solvent solution.

** Modifier additions are based on 100 parts of polystyrene emulsion solids.

*** Specific permeability is defined as the weight of moisture vapor in milligrams which passes through a film 1 square centimeter in area and 1 millimeter in thickness in 24 hours at 100° F.

The vinyl copolymer and the phenolic varnish were included as standards since they are both excellent in impermeability to moisture vapor.

TABLE II

Panel number	1	2	3	4	5
Casein	100	90	75	50	0
Plasticized Polystyrene Emulsion (BKS-92)	0	10	25	50	100
Scrub Test Results	Complete failure 12 strokes	25% failure 52 strokes	Same as #2 after 2000 strokes	Unaffected 20,000 strokes	Unaffected 20,000 strokes

TABLE III

Types

THE emulsions are available both as plasticized and unplasticized types. The plasticized emulsions form continuous films upon drying without the need for fusion at high temperatures. As the water leaves the film, the plasticizer particles spread and knit the polystyrene particles together to form a translucent, continuous film which has very good adhesion to most types of surfaces. This is in marked contrast to films of polystyrene deposited from solvent solutions which are characterized by a low degree of adhesion, even when plasticized. The plasticizers exert a solvating action on the polystyrene particles, thus speeding the development of film strength. The rapid rate at which resistance to water is obtained may be shown by coating a panel and then holding it under a

running water tap at five minute intervals. When tested in that manner under normal conditions, it is found that after approximately fifteen minutes' air-drying the film will not wash off or even soften appreciably.

The unplasticized emulsion is not a film-forming material when used alone because, on drying, it produces a dry, powdery layer of small discrete particles. It is useful, however, as a hardener for the plasticized emulsions for applications requiring less flexibility and softness. Additions of 10–20 parts of unplasticized emulsion to 100 parts of plasticized emulsion will be sufficient for most modifications of film hardness, but it is possible to add up to 50 to 60 parts of the unplasticized emulsion before a brittle, non-continuous film is formed. For most coating applications, particularly when pigmentation is employed, the plasticized emulsions should be used without such modification.

Emulsifying Plasticizers

ANOTHER use for the unplasticized emulsion is as a base to which the formulator may add his own plasticizers to meet special requirements. Certain plasticizers, including dibutyl phthalate, dibutyl sebacate, and dioctyl phthalate may be stirred directly into the unplasticized emulsion by means of a high speed stirrer. Most other plasticizers must be emulsified before adding them to the unplasticized emulsion unless the mixture is to be used immediately. A simple procedure which has been found satisfactory for emulsifying a wide range of plasticizers is shown below:

Formula:

Oleic acid—	5	parts	by	weight
Ammonium hydroxide —	2	"	"	"
Water —100		"	"	"
Plasticizer —100		"	"	"

Procedure:

Add ammonium hydroxide to the water, then add the oleic acid with agitation. Mix for five minutes and then add the plasticizer with thorough agitation. (Many anionic emulsifiers may be substituted for the ammonium oleate in this same emulsification procedure.)

The most useful range for coatings applications is 15 to 25 parts of plasticizer to 100 parts of unplasticized emulsion. Flexol 4GO is particularly efficient in producing flexible films having a minimum of surface tack. Dioctyl phthalate, on the other hand, is particularly useful for adhesive purposes since in combination with the unplasticized emulsion it develops a high degree of tackiness.

The physical properties of representative emulsions are given in Table I.

Formulating Notes

"BAKELITE" polystyrene emulsions are not difficult to use but with any emulsion system there are certain precautions to follow. The most important of these are given in the following brief summary.

Containers. These emulsions are packed for shipment in steel pails and drums which are lined with a baked phenolic resin coating. Such containers are readily available. Uncoated containers or lacquer-lined containers are unsuitable due to the probability of rust contamination. Galvanized iron containers are also to be avoided since the zinc lining promotes coagulation at the contact surface. Electroyltic tin-plate containers are not recommended for long storage of these emulsions since the tin layer is too thin. Terneplate cans have given excellent results in storage tests extending for over two years. Cans having a heavy tin coating and glass jars are, of course, quite satisfactory.

Equipment. As mentioned in the previous paragraph, contact with black iron or galvanized surfaces causes difficulties and this must be considered in equipment used in processing these emulsions. Copper is also to be avoided since it causes a greenish discoloration of the emulsion which is objectionable in most applications.

In any mixing, grinding, or pumping operation, care should be taken to avoid excessive heat. Certain types of grinding mills which cannot be kept cool should not be used for directly incorporating pigments in the emulsions. Such mills can be used, however, to prepare pigment-water pastes which can then be added to the emulsions.

In all mixing operations it is advisable to avoid excessive aeration of the emulsions since entrapped air bubbles are slow to rise and break. Consequently, applied films are apt to contain pinholes. The addition of pine oil helps to eliminate entrapped air bubbles, and there are several other types of additives which are quite effective in controlling the formation and persistence of foam. One of the best is a combination of equal parts of tributyl phosphate and octyl alcohol. The addition of one part of this mixture to 200,000 parts of emulsion has been found effective in most cases.

Drying Out. These emulsions, if allowed to stand in an open or partly filled container, will form a thin surface skin. This is not due to oxidation, but to evaporation at the surface causing de-emulsification of the surface layer. This may be overcome by floating a thin layer of pine oil on the surface.

Freezing. The unplasticized emulsion will stand freezing and thawing out without loss of stability. The plasticized emulsions, however, show some coagulation on freezing and the separated solids cannot be re-dispersed satisfactorily. The freezing point of these materials is in the range of 22° F to 25° F. The addition of protective colloids such as casein and alginates helps stabilize these emulsions where exposure to low temperatures is unavoidable.

Pigmentation

PLASTICIZED emulsions are used as clear sealers for porous surfaces, but they find their greatest usage in pigmented finishes. Pigments which are treated for water dispersibility are naturally easier to incorporate in the emulsions, but untreated pigments can also be used conveniently if a suitable wetting agent is employed during the pigment dispersion. Alkali resistant pigments having a minimum of water soluble components are preferred and, in general, pigments having a pH value above 7 are best for stability over long periods of aging.

One striking feature found in paints based on these emulsions is the fact that much lower pigment volumes may be used than in solvent-thinned vehicles. For example, a semi-gloss white enamel based on the plasticized emulsions may be formulated for satisfactory one-coat hiding using rutile titanium dioxide at a pigment volume ratio of about 13–14%.

(Turn to page 16)

new secondary alcohol

many possibilities in paint

AVAILABILITY in pilot plant quantities of a new unsaturated secondary alcohol, some of whose potential derivatives suggest interesting applications in the coatings field, has been announced by Rohm & Haas Company of Philadelphia.

Dicyclopentenyl alcohol, obtained by hydration of dicyclopentadiene, has a boiling point of 239–241° C. at 773 mm. (without decomposition), a flash point of 426° F. and an iodine number of 169. It is insoluble in water, and miscible in all proportions with nearly all the common organic solvents.

Its derivatives, such as dicyclopentenyl linoleate and allyl dicyclopentenyl maleate, have interesting air-drying and polymerizing properties which indicate potential uses in the coatings field. In general the dicyclopentenyl group contributes toughness and hardness while improving resistance to water and alkali.

Other derivatives which might serve as interesting raw materials for coating vehicles include di- (dicyclopentenyl) adipate or maleate, and vinyl dicyclopentenyl ether. Also, dicyclopentenyl acrylate and methacrylate are interesting monomers which co-polymerize with a wide variety of other monomeric materials and impart air-drying or heat-curing properties to the copolymers.

Dicyclopentenyl linoleate polymerizes to an insoluble coating when air-dried or baked in the presence of metallic driers. Preliminary tests on this material were done with .05% cobalt, .03% manganese, and .05% lead. Films were applied over tin and black plate at 3 mm. Baking schedules were one and two hours at 300° C. The baked material was nailproof at both schedules, and had somewhat the film characteristics of a coating from a baked unbodied oil. For such a low viscosity material, however, it was unusual in showing very little tendency to gather, pit or crawl during the baking. Resistance to boiling water for 30 minutes was excellent. The films failed in less than an hour when immersed in xylol.

Air-dried films were similar to those of linseed oil although, in general, they showed better hardness.

One of the most interesting potential uses for dicyclopentenyl linoleate is as a thermosetting plasticizer for the more unusual types of coatings resins utilizing vinyl type polymerization. Typical of these are diallyl maleate and unsaturated polyesters prepared from glycols and maleic anhydride with or without a saturated dibasic acid. Dicyclopentenyl linoleate is completely compatible with materials of this sort and copolymerizes with them during the curing operation. Films of such mixtures have good adhesion, toughness and gloss and, in many cases, outstanding resistance to water, caustic and strong solvents. In mixtures such as these, conventional metallic driers should be omitted; peroxides may be used instead.

Allyl dicyclopentenyl maleate is another interesting film-forming material. It can be "bodied" to a high viscosity with peroxide catalysts, and air-dried or baked films have excellent hardness and toughness. Allyl dicyclopentenyl maleate is miscible with drying oils, and a 1: 1 mixture with linseed oil baked 1.5 hours at 150° C. gave a pale, hard, tough, adherent, marproof coating on metal. Flexibility can be improved by co-reaction of the allyl dicyclopentenyl maleate with a diethylene glycol maleate polyester.

TESTING Techniques and

PART II

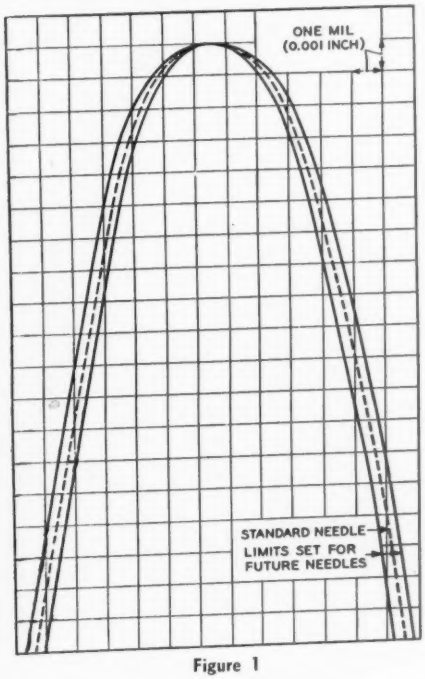
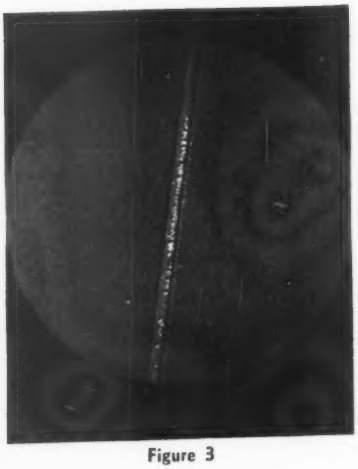


Figure 1

Figure 2



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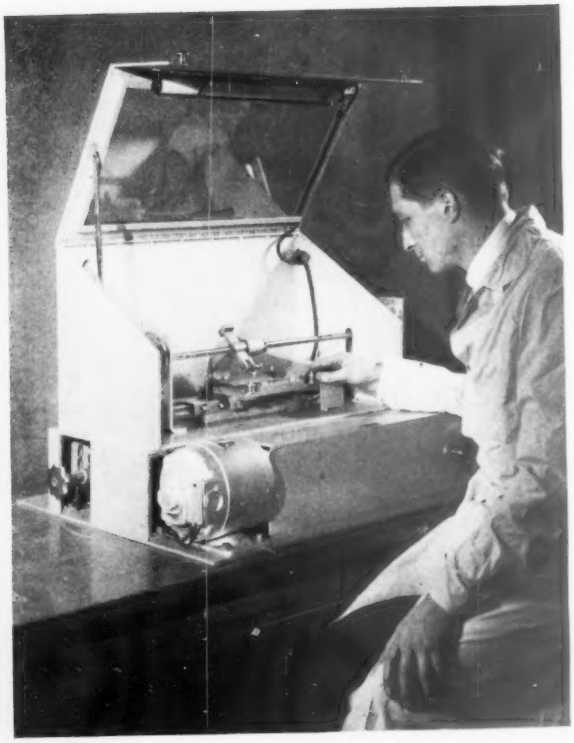

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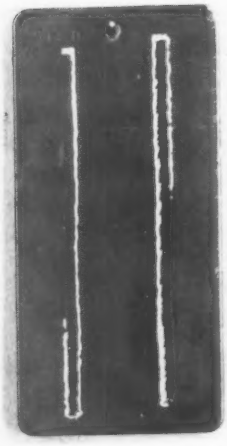


Figure 5

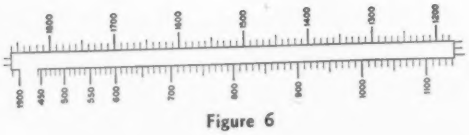


Figure 6

Uses of Equipment for Evaluating *Organic Coatings*

By R. J. PHAIR
Bell Telephone Laboratories

MAR testing is a measure of the degree to which a coating will resist the scratching and scarring actions which may be encountered in assembly operations or during service life. This characteristic is determined by substituting a needle for the stylus in the adhesion testing machine and employing this needle with increasing load to just rupture the upper surface of the coating. These loads may vary from 50 up to 350 gms. At loads less than the critical one, the surface of the film will be merely depressed. At the critical load, the film surface is torn. When viewed from above, in flat lighting, this ruptured line appears to be white. (Figures 1, 2, and 3 indicate the dimensions of the needle employed and illustrate the character of the depression and of the actual end point). As an illustration of the usefulness of this device, it was found that the baked black enamel used on the metal base of the desk type telephone would get through the numerous assembly operations in an unmarred condition if the value of mar resistance was 200 grams or greater. Materials having mar levels less than 200 grams would not necessarily suffer damage to a sufficient degree to expose the base metal but in many cases were rejected on the basis of unsatisfactory appearance.

Part II of this article is concerned with the measurement of mar testing and impact resistance, abrasion and hardness testing of finishes for metal products, and some special tests for wood lacquers. Part I, which appeared in the June issue dealt with the measurement of coating thickness, distensibility, and adhesion.

Impact Resistance

DURING assembly operations or service life, a finish may be subjected to single blows of varying intensity or to repeated impacts of constant intensity and it is desirable to know the extent to which the finish will resist this sort of abuse. In addition, impact measurements are useful in determining the adhesion or plasticity of the coating in a qualitative manner from the character of the impact pattern. This characteristic is measured in an automatic impact machine developed at the Laboratories. Essentially, the machine consists of a freely pivoted hammer mounted in a rotating arm so arranged that the speed may be increased from 450 to 1900 rpm. The panel is mounted on a table and is moved beneath the rotating hammer at a rate synchronized to the speed of the hammer so that a new area of the finish is presented for each succeeding blow. Impact resistance is expressed as the rpm of the hammer required to produce rupture of the finish and exposure of the base surface. (Figure 4 shows a view of the entire machine, Figure 5, an impact pattern produced on a black baking enamel, and 6 shows a transparent scale which is used in determining the speed of hammer rotation at the point of failure of the film).

This paper was presented before the Lacquer Committee of the National Paint, Varnish and Lacquer Association on January 19, 1950, in Washington, D. C.

Abrasion Test

IT is frequently desirable to ascertain the abrasion resistance level of applied coatings. A method which was originally developed in the Bell Laboratories for making this determination has now been adopted as a standard procedure by the A.S.T.M. (D-658-44). (See Figures 7,

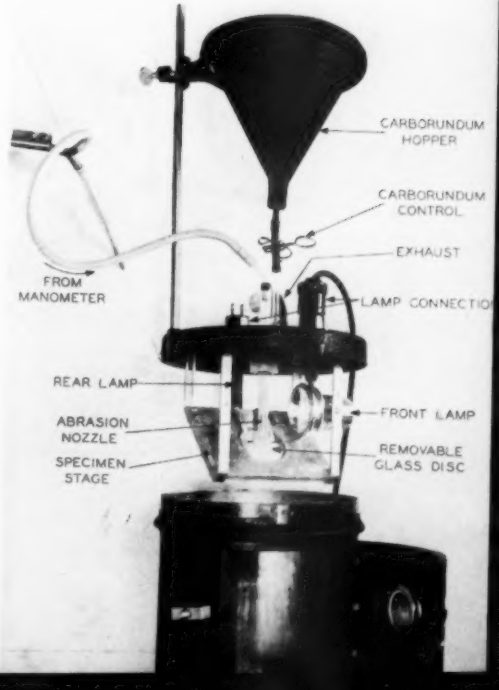


Figure 7

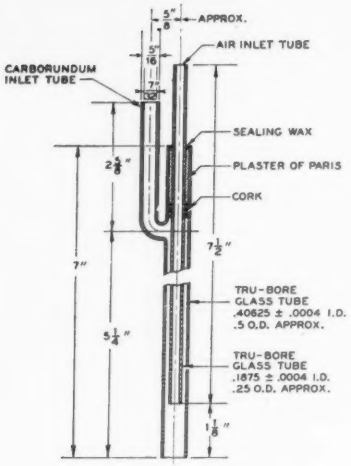

APPROX.
AIR INLET TUBE
CARBORUNDUM INLET TUBE
SEALING WAX
PLASTER OF PARIS
CORK
TRU-BORE GLASS TUBE .40625 ± .0004 I.D. .5 O.D. APPROX.
TRU-BORE GLASS TUBE .1875 ± .0004 I.D. .25 O.D. APPROX.

Figure 8

Figure 9

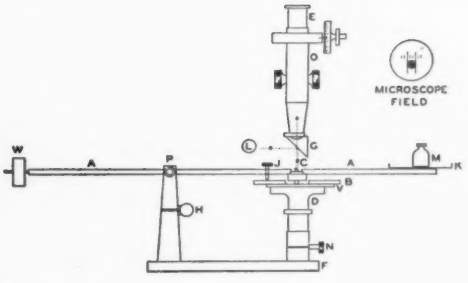


Figure 10

8 and 9, the first illustrating the carborundum air blast abrasion tester, the second, a schematic drawing of the nozzle, and the third, the abrasion end point). In usage, the panel is mounted at 45° to and in contact with the lower end of the nozzle. Under a controlled air blast, sufficient carborundum is permitted to impinge on the surface to wear through the coating exposing an area of the base 2 millimeters in diameter. From weight determinations of the carborundum hopper before and after test and from film thickness measurements in the immediate area of the wear pattern, it is possible to calculate the abrasion resistance in terms of grams of carborundum per mil of film.

Hardness

HARDNESS of a film is frequently of interest both as a measure of its functionality and as an indication of the optimum conditions for curing baked types of coatings. This characteristic is measured on the Pfund Hardness Tester. (See Figure 10). A hemispherical ended quartz rod ¼ inch in diameter is pressed on the film surface of 60 seconds at a pressure of 500 grams. A microscope having a vernier eyepiece is mounted above the quartz rod and the lighting is so arranged that the circle formed by the line of intersection of the film surface and the hemispherical end as the quartz rod penetrates the film is visible in the microscope field. Determination of the diameter of the circular pattern by means of the vernier eyepiece is employed as an expression of hardness.

With this rather hasty review of the testing instruments as a background, I would now like to briefly discuss the usefulness of the physical evaluation approach in some investigations which have been undertaken in the Laboratories. The first study we may consider, portrays the manner in which the testing techniques are employed in selecting the better quality materials from a group of finishes on a comparative basis. (Table I gives some of the data obtained in testing gray baking enamels both initially and after four months exposure in high humidity and outdoors). Test results indicated that one of the three materials shown was obviously brittle and non-adherent even in the initial stage, and was therefore unsuitable. The second enamel, although exhibiting good adhesional, impact, and distensibility characteristics in the initial stage, deteriorated rapidly on aging and was rejected. The third material, although at not quite as high a level in some of the characteristics in the initial stage maintained or improved in adhesion and distensibility on aging and of the three materials, would appear to be the most suitable.

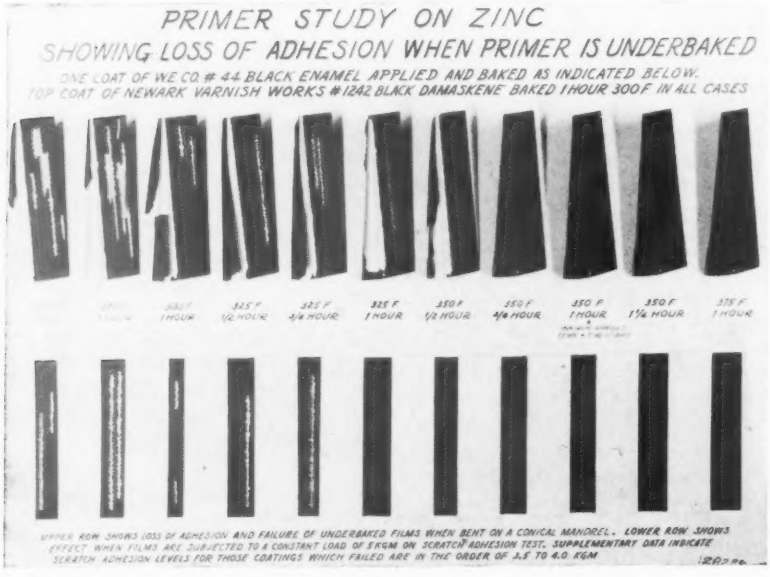

PRIMER STUDY ON ZINC
SHOWING LOSS OF ADHESION WHEN PRIMER IS UNDERBAKED
ONE COAT OF WE CO. # 44 BLACK ENAMEL APPLIED AND BAKED AS INDICATED BELOW.
TOP COAT OF NEWARK VARNISH WORKS # 1242 BLACK DAMASKENE BAKED 1 HOUR 300 F IN ALL CASES
300 F 1 HOUR
325 F 1/2 HOUR
325 F 3/4 HOUR
325 F 1 HOUR
350 F 1/2 HOUR
350 F 3/4 HOUR
350 F 1 HOUR
350 F 1 1/4 HOUR
375 F 1 HOUR
UPPER ROW SHOWS LOSS OF ADHESION AND FAILURE OF UNDERBAKED FILMS WHEN BENT ON A CONICAL MANDREL. LOWER ROW SHOWS EFFECT WHEN FILMS ARE SUBJECTED TO A CONSTANT LOAD OF 5 KGM ON SCRATCH ADHESION TEST. SUPPLEMENTARY DATA INDICATE SCRATCH ADHESION LEVELS FOR THOSE COATINGS WHICH FAILED ARE IN THE ORDER OF 3.5 TO 4.0 KGM

Figure 11

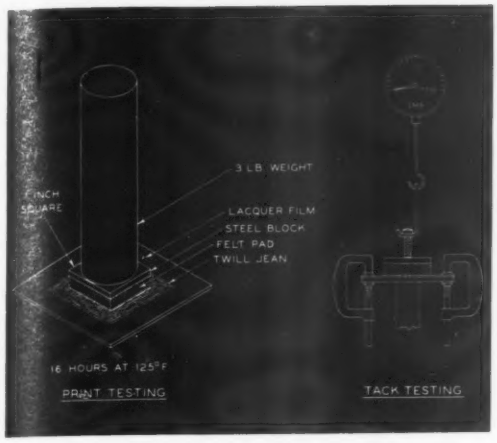


Figure 12

Mat.	Impact Resist. R.P.M.			Abrasion gms per mil			Adhesion Kgms			Distensibility Per cent		
	Initial	4 mo. Roof	4 mo. 95° 90%	Initial	4 mo. Roof	4 mo. 95° 90%	Initial	4 mo. Roof	4 mo. 95° 90%	Initial	4 mo. Roof	4 mo. 95° 90%
A	1790	1610	1840	59	62	59	3000	3000	4500	>28	>28	>28
B	1140	<450	1040	58	57	52	5000	<500	2000	21	<2.8	10.3
C	860	800	920	44	47	45	1500	1000	1500	<2.8	<2.8	<2.8

Table I

Finishes for Zinc

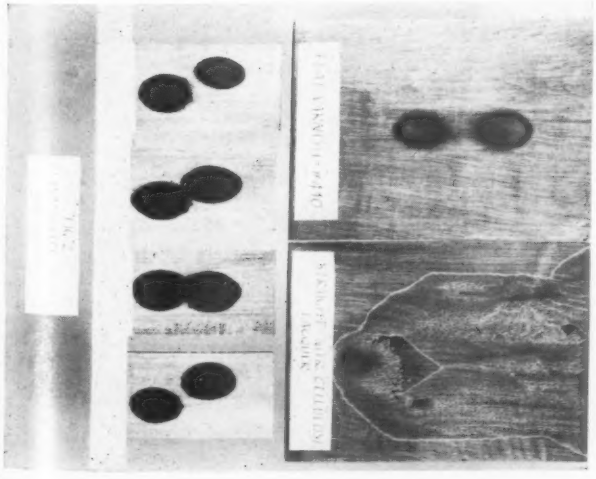
ANOTHER use of these testing techniques may be exemplified by a study conducted to ascertain the reasons for failure of a black wrinkle finish applied over zinc. The finish consisted of a coat of black baking enamel which served as a primer and a coat of black wrinkle enamel. Normally, the zinc would be phosphated before application of any organic coating but in this particular instance, the design of the apparatus prohibited the use of the phosphate application. Laboratory work on several possible primers had indicated that the black enamel selected has excellent adhesion to zinc, but in production considerable difficulty was encountered in chipping and flaking of the finish, particularly after finished parts had been stored for some time. Some preliminary check tests in the laboratory indicated that the degree of curing of the primer was the probable cause of the trouble and the study portrayed in figure 11 substantiated this theory and also indicated the minimum degree of cure which would produce a satisfactory coating. (Figure 11 shows several panels which had been bent on the conical mandrel and subjected to the scratch adhesion test). These panels had been prepared by applying a uniform thickness of the black enamel but the baking in each case differed by increments of 15 minutes or by temperature steps of 25° F. Temperatures employed varied between 250° and 375° F and the baking time from half an hour to an hour and a half. It was illustrated that the behavior of the film was drastically altered by underbaking and that above a certain level of cure, a completely satisfactory finish was obtained. The sensitivity of the testing techniques was exemplified by the fact that a difference of 15 minutes in curing time or of 25° F in temperature were detectable by the test apparatus.

Lacquer Finishes

THE third test program is concerned with a study conducted to establish satisfactory clear, flat lacquer finishes for use on wood. Switchboards, telephone booths, directory tables and associated wood structures have until recently been finished in flat varnish. However, to facilitate manufacture, it seemed desirable to swing over to lacquer, provided that the quality level could be maintained. It has been mentioned previously that in specific test programs, it is frequently necessary to supplement the data obtained on the instruments already discussed with other determinations and in this study of finishes on wood, it was felt desirable to employ supplementary tools for tack and print resistant determinations. Before proceeding with the lacquer study it may be well to briefly discuss the methods used in making these measure-

(*Turn to page 17*)

Figure 13



FLAT VARNISH STUDY

SPEC.	IMP. RPM	DIST. %	ABR.RES. GMS/MIL	SCR.ADH.KGM WITH	SCR.ADH.KGM ACROSS	MAR GMS.	
50B	530	2.9	22	2.0	2.5	150	INITIAL
56B	1040	28	64	5.0	5.0	250	
63AX	480	2.9	17	1.5	2.0	150	
64B	1060	21	44	5.0	4.0	200	
50B	470	2.9	23	1.0	1.5	50	2 MONTHS AGING
56B	1655	13	69	5.0	5.0	250	
63AX	710	2.9	17	1.5	1.5	50	
64B	895	28	36	5.0	5.0	150	

Table II

. . . POLYSTYRENE

(*From page 10*)

In a conventional varnish or alkyd vehicle this ratio would have to be approximately 18% for equivalent hiding power. Flats, similarly, may be formulated at much lower pigment volume ratios when these emulsion vehicles are employed.

Types of Pigments. Time has not permitted a complete study of the various pigment types but experience to date indicates that the following types are suitable:

Whites: Titanium dioxide, zinc sulfide, and lithopone. Calcium sulfate-extended titanium dioxide is not recommended because of poor stability. Zinc oxide may be used in small amounts but high concentrations should be avoided.

Extenders: China clay, barium sulfate, asbestine, talc, magnesium-calcium silicate, mica, and diatomaceous silica. Calcium carbonate and calcium sulfate are not recommended because of poor stability.

Oranges and Yellows: Molybdate orange, Hansa yellow, yellow ochres, and synthetic yellow iron oxides. Chrome yellows are not recommended because of excessive thickening.

Reds: Cadmium reds, water dispersible precipitated azo reds, and iron oxides.

Blues: Phthalocyanine blues and indanthrene blues. Iron blues are not recommended because of color fading. Ultramarine blues are generally not recommended since they generate hydrogen sulfide in water systems and result in poor stability and objectionable odor. However, these pigments vary considerably in this property and some can be used satisfactorily by incorporating as a buffer 5 parts zinc oxide per 100 parts of ultramarine blue.

Greens: Chromium oxides and phthalocyanine greens. Chrome greens are not recommended because of color fading.

Browns: Brown iron oxide (synthetic types are best) and burnt umber.

Blacks: Water dispersible lampblacks and aqueous carbon black dispersions.

Aluminum and other metallic powders: Many metallic powders and pastes, either water dispersible or non-water dispersible types, may be used. It is necessary to use a two-package container for aluminum paints because of gassing.

Note: Carbon blacks, bone blacks, and toluidine toners which have extremely fine particle size, are practically impossible to disperse by the methods described later in this paper. These and many other pigments are available, however, as pastes in water-dispersible film-formers or as pulp colors. A few of these have been tried and have been found to be quite satisfactory. However, pigmented dispersions in modified cellulose type film-formers are not recommended for use in protective coatings where washability is required since they remain permanently water dispersible and will not withstand washing or scrubbing.

Methods of Pigmentation. There are two general methods for pigmenting polystyrene emulsions. In the first, pigments are pre-mixed with the emulsion and then ground; in the second, a pigment-water paste is prepared and this paste can then be added to the emulsion or the emulsion can be added to the paste.

If non-water dispersible pigments are used, either in the pigment-emulsion pre-mix or in the pigment-water paste preparation, the use of a wetting agent is recommended. Anionic materials, such as salts of aryl or alkyl sulfonic acids, have been found to be very effective. In most cases, ½% to 1% of such a wetting agent based either on the weight of emulsion solids in the pigment-emulsion pre-mix or on the weight of water in the pigment-water paste will be satisfactory.

All of the conventional types of paint mixers and grinding mills may be used in producing pigmented polystyrene emulsions. However, the procedures used in dispersing pigments in solvent-thinned vehicles usually have to be modified to obtain best results with emulsified vehicles. A general guide to the best use of the various available types of paint mills may be summarized as follows:

Stone Mill and Roller Mill—a good pre-mix of the pigments in part of the emulsion in a pony mixer is definitely recommended prior to grinding on either the stone mill or roller mill. A wetting agent should be used in this pre-mix unless pigments treated for water-dispersibility are employed. Toward the end of the mixing operation it is important to add to the paste ¼% to ½% of a thickening agent based on the weight of emulsion in the paste. The thickener is needed to prevent the emulsion from drying out and to hold a stable viscosity during grinding. Without it the paste thins out too much. Two passes are recommended for either stone mill or roller mill grinding if highest gloss is desired. The paste may then be combined with the balance of the emulsion.

High Shear Type Mixer—For many uses where the optimum in pigment dispersion is not required, pigments can be dispersed directly into the emulsion by means of a high-shear type mixer.

Pony Mixer—A satisfactory paint for rough surfaces can be obtained by preparing a heavy-bodied paste of pigment in water by means of a pony mixer. This paste can then be added to the emulsion by simple stirring. This means of pigment dispersion is not as efficient as the methods mentioned above but is satisfactory for flats.

Pebble Mill—Direct pigmentation of the emulsions in pebble mills is not recommended because of the excessive foaming and resultant air-entrapment produced by this method. Pigment pastes in water, however, can readily be prepared in the pebble mill and these pastes may then be stirred into the emulsions. This is one of the simplest methods of pigmenting this type of vehicle.

Thickeners and Other Modifiers. Since the consistency of the polystyrene emulsions is reduced by the shearing forces exerted by many types of pigmenting or coating machines, it is often necessary to add thickening agents to obtain proper handling characteristics. For example, thickening is imperative for satisfactory pigmentation on a three-roll mill and it is necessary for good application by means of roller and blade coating machines. Suitable thickening agents include aqueous sodium polyacrylate dispersions, sodium and ammonium alginates, "Vinylite" SYHM and karaya gum. The use of a thickener permits the addition of a considerable amount of water which results in lower cost per unit volume.

Cost per gallon of flat paints may be reduced as much as 40¢ to 50¢ by the use of thickeners. The cellulosic thickeners are also effective in increasing viscosity and controlling application properties but they are not as suitable as those previously mentioned because their water sensitivity causes a sharp reduction in moisture resistance of emulsion films.

Pine oil is a very useful additive to the emulsions since it contributes a great deal to application properties. It serves as a mild thickener, giving a puffy consistency which is desirable for brush application. It has a moderate solvating action during film formation and promotes continuity by this means and by helping to eliminate foam. It is commonly used in amounts of 2% to 5% based on the total emulsion weight although 10% may be safely added.

Diethylene glycol is useful as an aid in improving brushability and flow of polystyrene emulsion paints. It is also used as an additive to improve stability at low temperatures.

Certain waxes are valuable as blending agents in these emulsion coatings to improve moisture impermeability and abrasion resistance. Polystyrene films deposited from solution in solvents are known to be highly permeable to moisture vapor. The plasticized polystyrene emulsion films are somewhat better and may be improved to a remarkable degree by the addition of small percentages of emulsified hydrocarbon waxes. The improvement in impermeability obtained by adding such waxes to the plasticized emulsions is indicated by tests run by the "Payne Cup" method. Films were cast on 2-mil rag stock, and the specific permeability was determined according to the method developed by the *New York Paint and Varnish Production Club.* (See Table II).

Applications

THE polystyrene emulsions have been adopted for a wide variety of uses, particularly where the coating of porous or absorbent surfaces is involved. They are being used in many types of household and maintenance finishes as well as in force-drying coatings for paper and fiber products. The following list shows some of the specific applications in which they are being used.

Household Flat and Semi-Gloss. The plasticized emulsions are being used in preparing emulsion paints of easy brushing qualities and better resistance to water and soap than conventional protein or oil-containing emulsion paints. For interior decorative paints they are being used with soya protein or casein to greatly improve their washability. To test the up-grading of casein by additions of polystyrene emulsions a series of blends was prepared in which the amount of polystyrene binder was increased from 0% to 100%. The paints were applied by brush on primed steel panels and were allowed to air-dry five days. They were then tested for washability using the general method described by Federal Specification TT-P-88. This method employs a stiff bristle brush bearing a one-pound weight and the brush travels back and forth in the same track. In this series the panels were immersed in water all during the scrubbing period. Tests on the better formulations were stopped at 20,000 brush strokes, and some idea of the severity of this test may be gained when it is realized that 20,000 strokes requires about four and one-half hours of constant scrubbing of a film completely immersed in water! The results of this series are given in Table III.

The sharp improvement obtained in washability with the addition of 25% polystyrene emulsion solids is likewise found in exterior exposure tests.

Sealers and Plaster Finishes. The excellent "hold-out" and alkali resistance of polystyrene emulsions account for their use as sealers for fresh plaster. The emulsions can be applied to plaster which has set for only 24 hours. When the emulsions are pigmented with alkali resistant pigments, they can be used as one-coat finishes on "hot" plaster. Such paints are being used successfully in dye rooms, laundries and other places where the walls are always wet.

Concrete and Masonry Finishes. Polystyrene emulsion paints retard penetration of moisture vapor and generally stop the passage of water through cement blocks, thus materially reducing erosion and efflorescence of concrete and masonry structures. In addition to water resistance and excellent exterior durability, these paints possess a high degree of alkali, acid and corrosive chemical fume resistance. They have shown promise for use as swimming pool paints and coatings for the interiors of silos as well as interior and exterior paints for brick and concrete.

Cement-Asbestos Shingles. Paints for cement-asbestos shingles based on these emulsions provide smooth surfaces which are resistant to dirt collection and water absorption. Due to their non-penetrating properties only one coat is needed to obtain an attractive appearance.

Paper, Fiber, Textiles, Leather. The emulsions are being used alone or in combination with proteins as force-dried coatings for wallpaper, fiber packages, wallboard, leather and numerous other materials for which good "hold-out," abrasion resistance, water resistance, and retention of flexibility are required. Coated paper may be stacked face-to-face under a load of 180 pounds per square foot for an hour at 140° F without blocking.

. . . TESTING

(*From page 15*)

ments. (Figure 12 illustrates the tack resistant and print resistant methods). In the case of tack resistance, a felt pad 1 inch square was placed on the surface of the film and was weighted with a load of 3 lbs. for 16 hours at a temperature of 125° F. After removal from the oven, the specimens were equilibrated to 77°, 50% humidity and the force in grams required to pull the felt pad from the surface was determined. Normally, it is not expected that this force should exceed 150 grams and in some instances, for example, in evaluating chair varnishes, the maximum would probably be in the order of 25 grams. In print resistant determinations, a piece of twill jean is inserted between the felt pad and the finish surface. The same procedure of loading and heating as previously mentioned for use in tack resistance is employed. After removal from the oven, the twill jean is immediately stripped from the surface of the coating and the degree of printing is qualitatively estimated by visual examination. The materials are classified in the print free, slight print,

moderate print or bad print categories.

In the actual lacquer test program, a group of about 20 suppliers of wood lacquers were contacted and acquainted with our requirements for flat lacquers. The materials obtained were tested by applying a three coat lacquer system consisting of one coat of sealer and two coats of flat lacquer to steel and to stained birch wood panels. These panels after drying for one week at 125° F. were equilibrated to 77° F, 50% humidity and tested. Other similar specimens were exposed for 5 and 10 weeks to an accelerated aging cycle. This cycle consisted of subjection to –18° F. for one hour, immediate transfer to a room maintained at 85° F., 90% humidity where they remained for two days. They were then transferred to an oven of 125° F. for two additional days and finally to a room maintained at 77°, 50% humidity. This cycle required one week and was repeated for the 5 and 10 week intervals mentioned. The results of this first group of tests as illustrated, Table III, were rather disappointing. The data obtained indicated a general failing in distensibility and in adhesion to the stained wood. By this time, it was apparent that the problem would narrow down to an effort to obtain a balance between distensibility and toughness on one hand, and tack and print-freeness on the other. The suppliers were recontacted and after several efforts, formulated the sorts of lacquers which we felt would be suitable for application on wood telephone equipments. The data obtained in the final stage of the test program as shown Table IV illustrates that it was possible to obtain lacquers of extremely low print and tack level which also had and retained upon aging, desirable levels of distensibility, adhesion and abrasion resistance. The tack and print determinations were run after the complete lacquer system had been air dried for six hours and for 102 hours. The short time air drying interval was employed to ascertain what difficulties might be encountered if finished parts were stacked in the production departments and the long interval, 102 hours, as an indication of behavior during shipment and service life.

Finally, having selected the lacquers which are felt to be suitable from the quality standpoint, it was necessary to supplement the data with a test designed to indicate the flame retarding properties of the lacquer materials. There had been a feeling in the Telephone System, probably the result of an unpleasant experience in the early days of lacquer formulation when practically straight nitro-cellulose was employed, that lacquer finishes on wood were undesirable because of the danger of flame propagation and it was necessary to reassure the people that recent developments in lacquer formulation no longer presented this hazard. The test method employed required that the film of lacquer applied to wood be mounted at 45° with the finish surface down. A flame about 1″ in height and an approximate temperature of 2000° F. was brought in contact with the lacquered surface for a period of 10 seconds. The flame was extinguished and the amount and duration of propagation of flame along the lacquered surface was noted. (Figure 13 illustrates the effects of this test on varnish, straight nitro-cellulose lacquer and on the four lacquer systems which had been selected on the basis of the physical tests). This picture also illustrates that although the propagation of flame on a straight nitro-cellulose material was rather pronounced, there was no perceptible difference in the behavior of the new resin modified lacquers and that of the varnish and that they were all satisfactory.

Interpretation of Data

OCCASIONALLY there is some hesitancy in accepting data which has been partially obtained on films applied to metal as a criterion for assessing the suitability of materials which in usage will be applied on wood. There is also a desire on the part of any investigator to be reassured that the test methods employed are reasonably indicative of the long term aging behavior of the coatings tested. For this reason, it may be desirable to briefly discuss part of the data accumulated in a study of flat varnishes conducted some 8½ years ago. The specimens in this test were prepared by applying 2 coats of some 65 different varnishes to stained birch wood panels and to clean steel. Some of these panels were measured initially for physical characteristics and others were tested after being subjected to the aging cycle which was mentioned in connection with the lacquer study outlined just previously. (Table II itemized some of the data obtained on four of the varnishes in the initial testing period and that obtained on the specimens which had been aged for two months). Of the four materials covered in this data, two had satisfactory levels in all the desirable physical characteristics. The other two on the basis of the data obtained were considered to be unsatisfactory, particularly in distensibility and adhesion. The wood panels have been retained for 8½ years and on recent examination were found to have aged exactly as predicted by the afore-mentioned testing data. Another point which might be worth considering is the fact that of the two materials which were discarded on the basis of these tests, one "checked" in the aging cycles and would probably have been discarded on the basis of this manner of evaluation alone. However, the other, even after six months of accelerated aging, showed no evidence of checking and unless supplemented by such physical measurements as distensibility and adhesion, would probably have been erroneously included in a listing of satisfactory materials.

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Metals Disintegrating Appoints Western Chemicals Distributor

Metals Disintegrating Company, Inc., Elizabeth, N. J., manufacturers of Metal Powders, Metal Pigments and Metal Abrasives, announced the appointment of Western Chemicals, Inc., Seattle, Wash. and Portland, Ore., as Northwest distributors of MD Aluminum Pastes, Aluminum Powders, and Gold Bronze Powders.

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R. J. Spitz Completes 25 Years with Newport Industries, Inc.

Starting in the Technical Sales Division of Newport Industries, Inc. at the inception of that department, R. J. Spitz, sales manager, recently completed a quarter century of continuous service with Newport.

FLAT LACQUER TESTS
GROUP A

		Initial Tests						5 Weeks Accel. Aging						10 Weeks Accel. Aging				
					Scratch Adhesion						Scratch Adhesion				Scratch Adhesion			
						Wood Kgms.						Wood Kgms.					Wood Kgms.	
Spec. No.	Thick Mils	Impact Res. R.P.M.	Distensibility %	Abrasion Res. gms/mil.	Metal Kgms.	With Grain	Across Grain	Impact Res. R.P.M.	Distensibility %	Abrasion Res. gms/mil.	Metal Kgms.	With Grain	Across Grain	Distensibility %	Abrasion Res. gms/mil.	Metal Kgms.	With Grain	Across Grain
2	1.3	< 450	< 2.9	23	1	3	3	Deteriorated. Could not be tested.										
3	1.4	"	"	25	1	5	4	< 450	< 2.9	18	1.5	4.5	4.5	< 2.9		1.5	4	4.5
4	1.4	"	"	34	1.5	4	4	"	"	33	1.5	4	3	"		2	3	4
5	1.3	"	"	23	1.5	5+	5+	"	"	22	1.5	5+	5	"	23	2	5+	5+
6	1.4	"	3.6	31	2	5	4	"	"	29	2.5	5	5	"	30	3	5	5+
7	1.3	"	< 2.9	25	1	4	3	"	"	23	0.5	2.5	5	"	23	0.5	3.5	4
9	1.4	"	"	30	1	3	3	"	"	36	1	2	3	"		1	2	5
10	1.3	"	"	23	1	2	2	Deteriorated										
11	1.5	"	5.9	28	2	5+	5+	< 450	4.6	25	2	5	5	"	29	2.5	5	5+
12	1.3	"	< 2.9	37	1.5	3	4	"	< 2.9	33	1.5	2.5	2.5	"		1	3	3
13	1.4	"	> 28	42	1	5+	5+	"	> 28	37	2	5+	5+	> 28	36	4.5	5+	5+
14						5+	4					5+	5				5+	4
15	1.4	"	> 2.9	24	1.5	2	2	< 450	< 2.9	21	1.5	1.5	3	< 2.9		1.5	2	2
16	1.2	"	"	34	1.5	2	2	"	"	34	1.5	2.5	3	"		1	2	4
17												2	2				2	3
1	1.4	"	13	22	4	2	2	< 450	< 3	23	4	3	4	< 2.9	22	4.5	4	4

Table III

FLAT LACQUER TESTS
GROUP C

		Initial Tests										5 Weeks Accel. Aging				10 Weeks Accel. Aging			
					Scratch Adhesion			Print Test		Tack Test Gms.				Scratch Adhesion			Scratch Adhesion		
					Wood Kgms.									Wood Kgms.			Wood Kgms.		
Spec. No.	Thick Mils	Impact Res. R.P.M.	Distensibility %	Abrasion Res. gms/mil.	Metal Kgms.	With Grain	Across Grain	After 6 hrs. a.d.	After 102 hrs. a.d.	After 6 hrs. a.d.	After 102 hrs. a.d.	Distensibility %	Abrasion Res. gms/mil.	With Grain	Across Grain	Distensibility %	Metal Kgms.	With Grain	Across Grain
50	1.7	< 450	> 28		2.5	5+	5+	print	print	566+	566+								
51	1.8	< 450	> 28		2.5	5+	5+	"	"	566+	...								
52	1.4	470	> 28	57	2.5–	5+	5+	slight print	slight print	566+	147	> 28	51	4	5+	> 28	2.5	5+	5+
53	1.7	470	> 28		5	4	4.5	print	print	566+	566+								
54	1.5	< 450	< 2.9		1	1.5	1.5												
55	1.3	490	< 2.9		2	2	2												
56	1.5	510	> 28	49	5+	5+	5+	print	slight print	178	156	> 28	48	5+	5+	> 28	2	5+	5+
57	1.5	480	17	42	2.5	5+	5+	See 67		See 67		14	44	5+	5+	15	3	5+	5+
58	1.6	1160	< 2.9		5+	5+	5+												
59	1.5	980	> 28	47	5	5+	5+	See 62		See 62		3		5+	5+				
60	1.4	800	< 2.9		2	5+	5+												
61	1.5	700	4		3.5	5+	5+	None	None	0	0	< 3		5+	5+				
62	1.6	500	21	36	3	5+	5+	very slight	very slight	0	0	17	38	5+	5+	18	3.5	5+	5+
63	1.5	710	< 2.9		1.5	5+	5+												
64	1.5	450	> 28		5+	3	3	very bad	very bad	566+	566+	> 28		3.5	4				
65	1.5	720	> 28	42	3	5+	5+	print	print	262	298	> 28	44	5+	5+	> 28	3.5	5+	5+
66	1.5	530	3		5+	5+	5+	very slight	very slight	0	0	< 2.9		5	5+				
67	1.5	640	> 28	57	5	5+	5+	print	print	156	128	> 28	56	5+	5+	> 28	3	5+	5+
68	1.5	480	< 2.9		5	5+	5+												
69	1.6	< 450	17		5+	5+	5+	print	print	566+	566+	< 2.9		5+	5+				
								After 27 hrs. Print	After 123 hrs. Print	After 27 hrs. 566+	After 123 hrs. 390								

NOTE:—Print and Tack tests were run only on those materials which had measurable distensibilities.
NOTE:—Data on aged panels were generally taken only in those cases in which the print and tack values were low.
NOTE:—The decided decrease in distensibility of panels No. 59 on aging was probably due to deterioration of the sealer. Panels No. 59 yellowed badly whereas panels No. 62 which were coated with the same flat lacquer did not yellow.

Table IV

PATENTS

Conducted by

Lancaster, Allwine & Rommel

PATENTS AND COPYRIGHTS

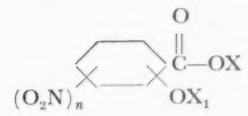
424 Bowen Building,
Washington, D. C.

Complete copies of any patents or trade-mark registration reported below may be obtained by sending 50c for each copy desired to Lancaster, Allwine & Rommel.

Corrosion Inhibitor

U. S. Patent 2,504,200. Sven Christian Johansson, Goteborg, Sweden.

A corrosion resisting coating composition drying, on application, to a solid surface and comprising the coating ingredients which thus dry and a small amount of a corrosion inhibiting agent sufficient to inhibit corrosion under at least atmospheric conditions and having the general formula



wherein each of X and X_1 is a member of the class consisting of hydrogen, the methyl group, the ammonium radical, and the alkali and alkaline earth metals, and X_1 is linked to a ring carbon free of linkages to any other substituent group, and n is 1 or 2.

Corrosion Preventive

U. S. Patent 2,509,786. Knapel F. Schiermeier and Herbert A. Poitz, Alton, Ill., assignors to Shell Development Company, San Francisco, Calif., a corporation of Delaware.

A composition of matter adapted for use as a rust inhibitor comprising a major amount of a light liquid hydrocarbon, from about 5% to about 25% of an oxidized waxy hydrocarbon, between about 2 to 10% of a mixture of alkaline earth metal salts of organic sulfonic acid and about 1% to about 5% of a non-aromatic alcohol.

Reversible Gel Composition

U. S. Patent 2,506,537. Carl E. Barnes, Pipersville, and William O. Ney, Jr., Easton, Pa., assignors to General Aniline & Film Corporation, New York, N. Y., a corporation of Delaware.

A firm thermal-reversible aqua-gel having a pH of 4–9, containing, as the gel-forming constituents thereof, a water soluble polyvinyl alcohol and an interpolymeric product obtained from a compound selected from the group consisting of acrylic acid and α-substituted acrylic acids with an amide of said acids in which the respective amounts of said acids and of said amide are each at least 25% by weight of the interpolymer, the weight ratio of the amounts of polyvinyl, alcohol and of said interpolymeric product being within the range of 1: 9 to 9: 1.

Bitumen-Treating Agent

U. S. Patent 2,508,924. Edward W. Mertens, Berkeley, and Don E. Stevens, Fairfax, Calif., assignors to California Research Corporation, San Francisco, Calif., a corporation of Delaware.

An improved bonding bituminous composition consisting essentially of a bituminous substance normally possessing stripping tendencies and, intimately dispersible therein, a small amount sufficient substantially to lessen stripping of said bituminous substance, of the salt of an acylamido amine having at least one free amino group and an organo-substituted inorganic acid having at least one free ionizable hydrogen and at least 2 carbon atoms, said salt having at least 8 carbon atoms in the molecule.

Polyethylene Wax Compositions

U. S. Patent 2,504,270. Frederick H. MacLaren, Munster, Ind., and John A. Anderson, Chicago, Ill., assignors to Standard Oil Company, Chicago, Ill., a corporation of Indiana.

The method of preparing a wax composition containing an ethylene polymer having an average molecular weight of from about 5000 to about 25,000; comprising milling an ethylene polymer having an average molecular weight of from about 5000 to about 25,000 with from about 5% to about 60% by weight of a petroleum wax at a temperature of from about 220° F. to about 360° F. to obtain a homogeneous blend of said petroleum wax and said polymer, and then dissolving said blend in petroleum wax at a temperature of from about 140° F. to about 250° F. to obtain a complete solution of the ethylene polymer in the petroleum wax.

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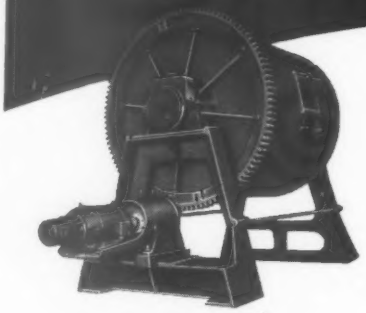

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Emulsion Polymerization

U. S. Patent 2,496,384. Willem Leendert Johannes de Nie, Amsterdam, Netherlands, assignor to Shell Development Co., San Francisco, Calif., a corporation of Delaware.

In a process for production of copolymer of substantially homogeneous composition wherein a mixture containing at least 1% each of monomers of two substantially water-insoluble polymerizable compounds, each of which contains the polymerizable group.

$$CH_2=C\diagup\diagdown$$

and no other polymerizable group, is subjected to polymerizing conditions in aqueous emulsion, the improvement which comprises introducing a mixture of monomers of the polymerizable compounds to the reaction mixture at about the moment when copolymerization begins, the composition of the added monomers being substantially the same as the composition of the monomer constituents chemically combined in the copolymer; continuing the addition of the monomer mixture during the course of the copolymerization at about the rate at which copolymer is formed so that the composition of the monomers undergoing copolymerization does not appreciably change during the polymerization; and stopping the copolymerization at about the same time that addition of further monomers to the copolymerizing mixture is discontinued.

Coating Compositions

U. S. Patent 2,507,699. Donald E. Edgar, Westport, Conn., and Hilmer E. Winberg, Wilmington, Del., assignors to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware.

A calenderable composition comprising a chlorosulfonated polymer of ethylene, curing agents therefor and polyoxyethylene glycol, said glycol being present in amount between 2 and 5 parts for every 100 parts of the chlorosulfonated polymer of ethylene.

Tall Oil Treatment

U. S. Patent 2,509,884. Ronald Rosher, Wilmington, Del., assignor to Hercules Powder Company, Wilmington, Del., a corporation of Delaware.

The process of separating the resin acids from tall oil which comprises selectively esterifying tall oil to form a mixture comprising fatty acid esters and resin acids, dissolving said mixture in a liquid petroleum hydrocarbon solvent, and precipitating the resin acids from the resulting solution with cyclohexylamine.

Tall Oil Esters

U. S. Patent 2,503,772. John B. Rust, East Hanover, New Jersey assignor, by direct and mesne assignments, of one-half to Montclair Research Corporation, a corporation of New Jersey, and one-half to Ellis-Foster Company, a corporation of New Jersey.

A heat-convertible liquid for coating compositions comprising a polyhydric alcohol esterified with tall oil and dicarboxylic acid monoester of a beta-unsaturated monohydric alcohol having from 3 to 4 carbon atoms, the polyhydric alcohol containing more than 2 hydroxyl groups and having the formula $R(OH)_n$, where R is a saturated hydrocarbon residue and n is the number of hydroxyl groups, the proportions being from 2 to $(n-0.5)$ moles of tall oil, from $(n-2)$ to 0.5 moles of dicarboxylic acid monoester, from 1 to 1.1 moles of polyhydric alcohol, and the total moles of tall oil and dicarboxylic acid monoester being n.

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•
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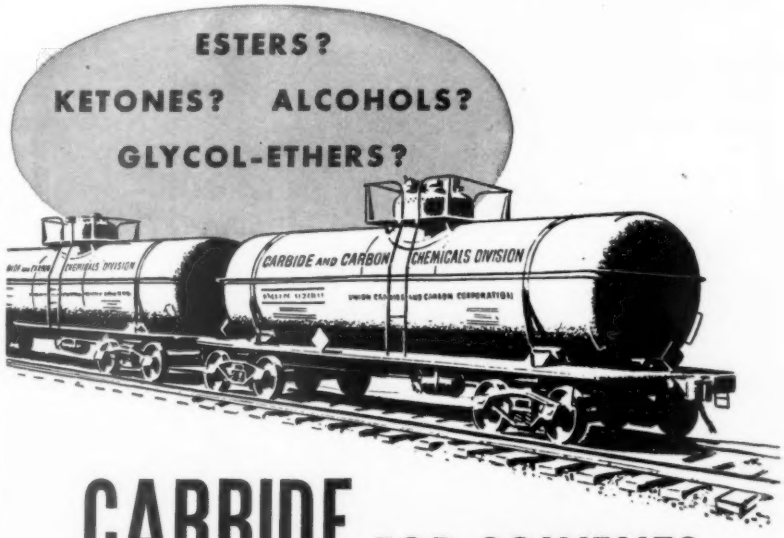

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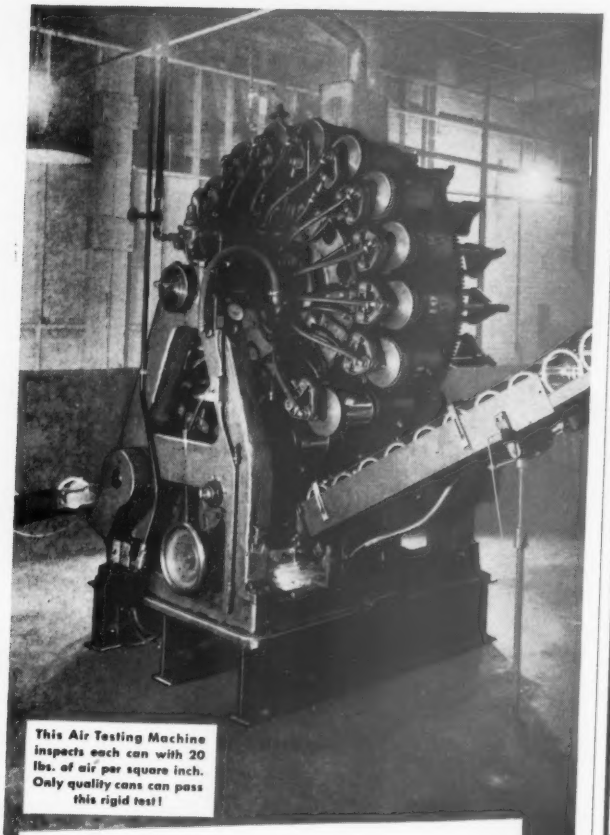

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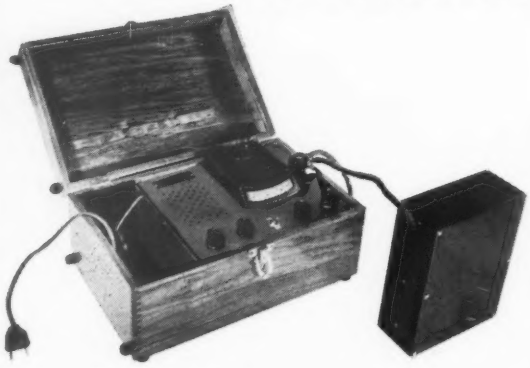

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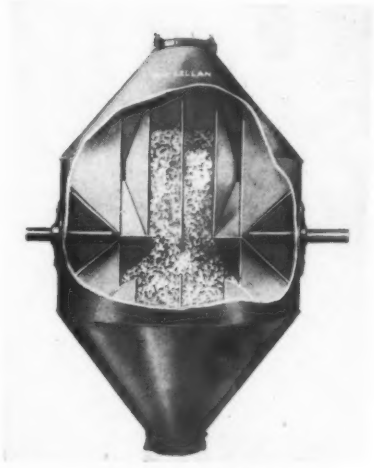

Anglo American Mill

DRUM MIXER

Blends Dry Materials

Mixer is used for blending dry free flowing materials. The simple construction of this sturdy unit is shown by the cutaway view. Materials charged into lower compartment are divided by wings. Rotation of drum carries materials above the axis until they fall by gravity, discharging successively from pairs of pockets, pyramiding into the other end of drum. This operation is repeated every half revolution giving sixty complete separations and mixes in five revolutions.

Capacities: 5 quarts to 160 cubic feet. Anglo American Mill Sales Co., Owensboro, Kentucky. PVP—July.

HOT PLATE

150 to 600 F.

Thermostatic hot plate can maintain liquids at predetermined temperatures of 150 to 600 deg. F. Operates on 115 volts with a power-demand 500 watts. Central Scientific Co., 1700 Irving Park Rd., Chicago 13, Ill. PVP—July.

PERACETIC ACID

Polymerization Catalyst

Suggested uses for peracetic acid in bulk, emulsion, and suspension polymerization processes. Available in 40% solutions. May also be used as an oxidizing agent. Buffalo Electro-Chemical Co., Inc., Station B, Buffalo 7, N. Y. PVP—July.

MOISTURE METER

For Wood and Plaster

Moisture content of wood and plaster can be determined quickly with the new Tag Midget Moisture Meter.

Weston Electric

To check wood, the user inserts the needle electrodes in the sample, presses a button, and reads moisture content direct from the large, open scale, calibrated from 7 to 30 per cent moisture. To check plaster, the user removes the needles and presses the electrodes directly against the surface being tested. The meter will then indicate whether the moisture content of the plaster is above or below the value considered the maximum for dependable, peel-proof painting.

Tagliabue Div., Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J. PVP—July.

HIDING CHART

Vinyl Coated

Charts bearing black, white and gray patterns of rated color strength are coated with transparent Vinylite resins which prevents the paint from soaking into the paper charts, thus providing a good surface for application of the sample. In addition, the Vinylite resin coating does not discolor. This color retention is important, since the result of a hiding power test depends on the color and shade of a chart after a known quantity of paint has been spread evenly over its one square foot or one-half square foot surface. Thickness of the paint film is easily calculated, and its hiding power can be determined either visually or by mechanical means. Charts are made to be used with Hunter Multipurpose Reflectometer for contrast ratio measurements. The charts are available in patterns of black over gray, gray over white and black over white—all colors of predetermined light-absorbing capacities. The Morest Co., 211 Centre St., New York 13, N. Y. PVP—July.

Morest

NEW PRODUCTS

Fisher Scientific

LABORATORY MIXER

Reduces Mixing Time

Fisher-Goldman Mixer performs operations in as little as one-tenth the time previously required—and the resulting mixture is much more homogenous. It can be used for liquid-liquid, liquid-solid, or liquid-gaseous dispersions, according to the manufacturer.

This mixer employs a slightly curved, rotating paddles (adjustable for different viscosities) to effect the actual agitation. However, the principal advantage and difference between this and ordinary stirrers, is that three baffles, freely suspended in the liquid, are added to break up the whirlpool action. The paddle-baffle arrangement mixes the liquid both horizontally and vertically, with the movement proceeding outward, upward, over, down—the liquid being "folded" into itself. Fisher Scientific Co., 717 Forbes St., Pittsburgh, Pa. PVP—July.

COMPACT VALVE

CO_2 Fire Extinguishers

A valve for use on 2- to 20-pound carbon dioxide fire extinguisher has received Underwriter's approval. The valve features a carrying handle and an operating valve lever designed to give thumb-tip control for the flow of gas. A locking device allows securing the valve in either open or closed position. Kerotest Mfg. Co., 2539 Liberty Ave., Pittsburgh 22, Pa. PVP—July.

DISPERSING AGENT

For Pigment Suspensions

Dispersion of insoluble particles in aqueous suspensions and in the preparation of oil-in-water and asphalt emulsions have been made possible through the use of three dispersants. They are Marasperse C, a calcium salt of a complex organic acid, Marasperse N, a sodium salt of a complex organic acid, and Marasperse CB, a highly refined sodium salt of a complex organic acid. They prevent the formation of agglomerates and act as stabilizers in emulsions, according to the manufacturer. They are also effective in decreasing the viscosity of a given system. The CB type is recommended for clay, carbon black, zinc oxide, and titanium dioxide. For further details, write to the Marathon Corp., Chemical Div., Rothschild, Wis. PVP—July.

PHOTOCHEMICAL LAMPS

For Polymerization

Three new lamps, types C-H9, A-H13, and A-H14, are available for use in photochemical processes. They are designed to emit a maximum of energy in the commonly utilized wave-lengths near 3,650 A., these lamps are suitable for applications such as chlorination of hydrocarbons, bromination, hydrogenation, polymerization decomposition, etc. Westinghouse Electric Corp., Lamp Div., Bloomfield, N. J. PVP—July.

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Color Barrett	27
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Iodine Number	200 min.
PANAREZ 3-210	
Color Barrett	7
Softening Point °F	200-220
Iodine Number	180 min.
PANAREZ 6-210	
Color Barrett	3
Softening Point °F	200-220
Iodine Number	175 min.

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NEW PRODUCTS

LEAD PIGMENTS

Rust Inhibitive Types

Two new rust inhibitive white lead pigments, non-reactive toward vehicles containing free carboxyl groups, have been introduced to the paint and varnish industry. They are known as trilead orthophosphate and dilead pyrophosphate, and are said to be among the few rust inhibitive materials which are non-reactive with solution coatings composed of a polyvinyl chloride-acetate copolymer modified with a dicarboxylic acid.

Because of free carboxyl groups, this resin reacts readily with most conventional primer pigments, particularly with corrosion inhibiting types, such as the zinc and lead chromates and red lead, resulting in the entire composition setting up in an unbreakable gel.

When lead phosphates are used, the gelatin does not occur. In addition, the lead phosphates appear to inhibit corrosion. They do not function, however, as heat and light stabilizers. Monsanto Chemical Co., St. Louis 4, Missouri. PVP—July.

LIGHT WEIGHT TRUCK

Moves Drums Easily

Weighing 28 pounds, this truck is useful in handling drums and barrels. It is made with one or two handles and with open or closed nose. It is also provided with skids. For further information write to Hamilton Caster & Mfg. Co., 1681 Dixie Highway, Hamilton, Ohio. PVP—July.

DISPERSING AGENTS

Variety of Uses

"Sotex" are a series of surface active agents used to help in the dispersion of organic and inorganic pigments in alkyds, drying oils, melamine and urea formaldehyde formulations. It is also recommended for the dispersions of plasticols, and organosols. These agents will increase the solubility of high molecular materials, and control the viscosity of dip enamels. Prevents flooding and silking. For more information on these agents, write to Synthetic Chemicals, Inc., 335 McLean Blvd., Paterson, N. J. PVP—July.

LEVEL TRANSMITTER

For Liquids

Transmitter, using buoyant force on a partly immersed cylinder, requires neither purges nor liquid seals, according to the manufacturer. It can be operated for long periods with practically no maintenance, the engineers said. Its sensitivity is one part in 14,000, and has a reproducibility with plus or minus one per cent of full scale.

The new device is used for differences of level ranging from 14 to 120 inches, for liquids of various specific gravities and viscosities, and at working pressures as high as 600 pounds per square inch at temperatures up to 450 degrees Fahrenheit. Brown Instruments Div., Minneapolis-Honeywell Regulator Co., Wayne & Roberts Avenues, Philadelphia 44, Pa. PVP—July.

AIR VELOCITY METER

For Process Control

Air velocity meter gives instantaneous and accurate reading of velocities from 5 to 6000 fpm. It is recommended for air conditioning and process control where quickly obtained readings are wanted. According to the manufacturer, it is unaffected by temperature changes. Hastings Instrument Co., Inc., Hampton, Va. PVP—July.

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Almon G. Hovey

A. G. Hovey Joins Research Div. Of Archer-Daniels-Midland

Almon G. Hovey, nationally known authority on resins and fatty acids, recently joined the research division of Archer-Daniels-Midland.

Hovey has more than 25 years experience as a specialist in development, production, utilization, and other research problems pertaining to synthetic resins.

In 1924, after his graduation from Dartmouth College, he joined the research staff of General Electric Co., of Schenectady, New York. He spent nine years with GE in the development of insulation, resins, coating materials, plastics, adhesives, and specialties. During this time he was a pioneer in theories of resin formation which have since become widely accepted throughout the chemistry profession.

In 1933 he was appointed director of research for Beck, Koller & Co. which later became Reichhold Chemicals, Inc.

Between 1944 and 1949, Hovey was a member of General Mills Chemical Division in Minneapolis, where he was in charge of new chemicals development and chemical sales service.

•

General Latex to Distribute Goodyear Chemigums in N. E.

Appointment of the General Latex and Chemical Corporation, Cambridge, Mass., as a distributor, in the New England area, of Chemigum synthetic latices of the nitrile type has been announced by the Chemical Division of The Goodyear Tire & Rubber Company.

George H. Fitch Named Mgr. Of Devoe & Raynolds Co.

Appointment of George H. Fitch as advertising manager of Devoe & Raynolds Company, Inc. was announced recently by E. S. Phillips, chairman. Mr. Fitch, formerly was advertising manager for the Jones-Dabney Division in Louisville. He will supervise all advertising, merchandising and sales promotion for all divisions of the paint company with which he has been associated since 1940.

•

Advance Driers Forms Canadian Company

Mr. Arthur B. Mullaly, president of Advance Solvents & Chemical Corp., New York, announced recently that they have formed a new company, Advance Solvents & Chemical Corp. of Canada, Ltd. in Montreal. Early manufacture of Soligen (naphthenate type) and Hexogen (octoic type) driers for the paint and protective coatings industry is contemplated.

•

National Lead Names R. B. Gilbert Manager

R. B. Gilbert has been appointed trade sales manager—paint products of National Lead Company's Atlanta Branch. Mr. Gilbert began his company career in 1928 as a salesman in Ohio. For the past twenty years he has been on the paint sales staff of the Cleveland Branch, where he became paint trade sales manager in 1947.

Hercules Powder Transfers

Two transfers of personnel have been announced by the Cellulose Products Department of Hercules Powder Company. Robert E. Steeper will move from the Hopewell, Virginia plant to Wilmington, where he will work on sales development of new cellulose products. Harold Jenkins will join the Cellulose Products development group at Hopewell, moving there from the Hercules Experiment Station, near Wilmington.

•

L. R. Sperberg Joins J. M. Huber Corp.

Lawrence R. Sperberg has joined the staff of the J. M. Huber Corp. as chief chemist of the Carbon Black Div., which is located in Borger, Texas.

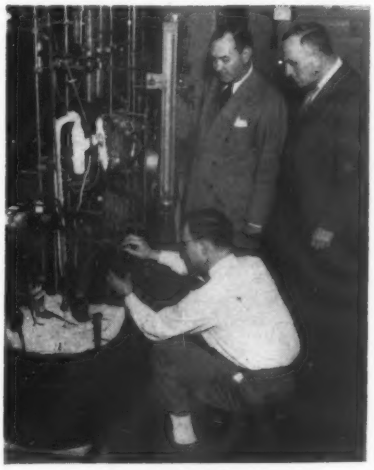
•

Resin Display at Am. Cyanamid Stamford Research Laboratories

This interesting display was shown at the recent open house held at the Stamford Research Laboratories of the American Cyanamid Co.

It indicates how the combination of melamine and formaldehyde results in resins which are becoming increasingly important to such industries as textiles, paper, surface coatings, and plastics. Not only were actual steps in the Manufacturing process shown, but also there was a display of the various products in which the resins were used. These melamine formaldehyde resins were developed in the Stamford Research Laboratories.

American Cyanamid Exhibit



Commercial Solvents

J. Albert Woods Inspects CSC's Research Center

President J. Albert Woods of the Commercial Solvents Corp., inspects a laboratory unit in CSC's Research center at Terre Haute, Indiana. Mr. Woods was recently elected president of the Commercial Solvents Corp. For many years he has been active in the agricultural chemical field with experience in both production and sales. Standing left to right: J. Albert Woods and T. S. Carswell, Vice President of Research.

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Irvington Varnish Appoints Pardy

John J. Pardy has been appointed assistant to the general manager of the cap seal division, Irvington Varnish & Insulator Company, Irvington, N. J.

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A. B. Bingham of PPG Honored

Albert B. Bingham, divisional director, Pittsburgh Plate Glass Company, Newark, has been awarded an honorary certificate in recognition of his work in the development of industrial standards. Mr. Bingham has been a member of the ASA Standards Council for the past three and a half years, representing the National Paint, Varnish and Lacquer Association. The association is one of the 101 national technical societies and trade associations that work together in ASA.

Meet

D. C. CARRUTHERS

Douglas C. Carruthers is manager of Pittsburgh Plate Glass Company's modern paint plant at Springdale, Pa. Associated with the firm's paint division since 1934, Mr. Carruthers was transferred from Pittsburgh Plate's Ditzler Color Division at Detroit to the managership of the $1,750,000 Springdale plant.

During his twelve year association with Ditzler, a leading producer of finishes for the automotive industry, Mr. Carruthers directed the personnel, safety, and plant engineering departments.

A graduate of Michigan State's School of Engineering, the Pittsburgh paint executive served with the U. S. Army for more than sixty-five months in World War II. After lengthy service with the General Staff in the Pacific, he was separated from the service in 1946 with the rank of colonel.

Pittsburgh Plate's Springdale plant is the most modern in the world and one of the largest in the country. It consists of a main building for manufacturing paint, an office building having a wing for a laboratory, a varnish and resin manufacturing building, and a power plant.

The buildings are of modern fireproof construction, using extensive glass areas and are painted according to color engineering principles. The plant has a total floor area of approximately 200,000 square feet.

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U. S. Testing Co. Installs Electron Microscope

The United States Testing Company, Inc., announces the recent installation of an electron microscope. This is another step in the company's program of providing the finest scientific tools for the evaluation of the problems of industry. Through this continuing program of advancement, industry will derive the benefits of knowledge obtained, at nominal cost, heretofore unobtainable with the finest light microscope.

The electron microscope has proved its worth in studies of particle size and structure, plastics, textiles, colloidal particles, crystals, viruses and bacteria, and many other fields. It has been responsible for many technological developments through its revelations.

A. K. Burke of Du Pont Finishes Div. Retires

Alfred K. Burke, director of production of the Finishes Division of the Du Pont Company, retired after July 1, after more than 35 years with the company.

Simultaneously it was announced that Lyman H. Priday, assistant director of production, will become director of production, and Dr. Harold E. Goldsmith, now regional sales manager at Boston, assistant director of production.

Mr. Burke joined the Du Pont Company as a chemist in its Smokeless Powder Department at Carney's Point, N. J. In 1918 he was transferred to the finishes plant at Parlin, N. J., which in the next few years was engaged in the process of developing Du Pont's new "Duco" nitrocellulose lacquer for automobiles. In 1924, at the start of the large-scale use of "Duco," Mr. Burke was made assistant plant manager at Parlin. He successively served as manager of the finishes plants at Flint, Mich., Toledo, Ohio, and Parlin, before coming to Wilmington in 1943 as director of production of the Finishes Division.

•

Cathcart Wins Glidden Award

The Senior Salesman's award of $1000 was won by S. C. Cathcart, a veteran industrial paint salesman in the Cincinnati area for the Glidden Co.

The year-long "Greater Glidden Award" contest is divided into two divisions of senior and new salesmen and is limited to salesmen from the Durkee Division and the Paint and Varnish Division. Prizes are based on all-around sales accomplishment, as well as on the actual volume of sales. Winners are selected by five top executives of the company.

Mr. Cathcart has served Glidden since 1933 and has been an outstanding salesman for many years.

S. C. Cathcart

J. B. Diepenbrock

J. B. Diepenbrock Named Western Representative for Marlow Pumps

Appointment of J. B. Diepenbrock as district sales representative for the West Coast is announced by Marlow Pumps, Ridgewood, New Jersey. Mr. Diepenbrock, formerly associated with Ingersoll Rand and Dow Chemical, will take charge of Marlow Municipal Pump sales in California, Oregon, Washington, Idaho, Nevada, Arizona, western Montana, and Utah.

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A.S.T.M. Awards For Technical Papers

In recognition of outstanding technical papers presented at its previous Annual Meetings, the American Society for Testing Materials made awards for three papers, the authors receiving the awards at the Tuesday evening session of 1950 Annual Meeting in Atlantic City, during the week of June 26. The awards are as follows:

Charles B. Dudley Medal—to Professor B. J. Lazan, Syracuse University, Syracuse, N. Y., for his paper entitled "Dynamic Creep and Creep-Rupture Properties of Temperature-Resistant Materials under Tensile Fatigue Loading." This medal is presented for a paper of outstanding merit constituting an orginal contribution on research in engineering materials.

Richard L. Templin Award—to Professors D. S. Clark and D. S. Wood, California Institute of Technology, Pasadena, Calif., for their paper entitled "The Time Delay for the Initiation of Plastic Deformation at Rapidly Applied Constant Stress." This award is presented for a significant paper describing new testing methods and apparatus, the purpose of the award being to stimulate research in the development of testing methods and apparatus.

Sam Tour Award—to O. B. Ellis, Senior Research Engineer, Armco Steel Corp., Middletown, Ohio, for his paper entitled "Effect of Weather on the Initial Corrosion Rate of Sheet Zinc." This award is presented for the purpose of encouraging research on the improvements and evaluation of corrosion testing methods and to stimulate the preparation of technical papers in this field.

•

Arrow Lacquer Moves

Arrow Lacquer has recently moved its offices, laboratory, and factory to 208 DuPont St., Brooklyn, N. Y. The new factory combines the operations of Arrow and the Admiral Paint & Lacquer Corp.

Custom-Mixed Paint Color Demonstration

A method for creating over 1,000 paint colors was recently presented to Chicago dealers by the Elliott Paint and Varnish Company, 4523 West Fifth Avenue, Chicago.

The technique utilizes an exclusive, newly-developed Elliott measuring device which eliminates much of the time, inventory and expensive equipment formerly required.

Among the features of the Elliott system are the patented measuring device; the Elliott Color Harmonics Library with 1,152 color chips arranged according to color classification, and the fact that never more than two of the basic six colors: yellow, orange, red, purple, blue or green, are ever required to mix any of the 1,152 colors. All colors are available in flat and eggshell finish.

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TECHNICAL Bulletins

TITANOX PIGMENTS

The extensive development of titanium pigments within the past two years has prompted the Titanium pigment Corp. to publish a book which is a guide to Titanox users. Expanded information includes descriptions of new products and new applications, with charts and illustrations. Suggested applications of the Titanox pigments are given together with their properties. Obtain your copy from Titanium Pigment Corp., 111 Broadway, New York 6, N. Y.

PLIOLITE S-5

Techni-Guide #517, issued by the Goodyear Tire & Rubber Co., Inc., Akron, Ohio, gives information on the use of Pliolite S-5 in exterior stucco and concrete paints. Formulation, method of manufacture, and properties of these paints are also discussed.

INDUSTRIAL CHEMICALS

Forty-two page catalog contains specification, physical and chemical properties of aliphatic chemicals such as acids, anhydrides, alcohols, aldehydes, plasticizers, solvents, etc. Included also are the cellulose products such as cellulose acetate, cellulose acetate butyrate, and oxidized cellulose. Catalog is available from the Tennessee Eastman Corp., Kingsport, Tenn.

FINE MICRON TALCS

Sierra Talc & Clay Co., 5509 Randolph St., Los Angeles 22, Calif. has recently published technical data sheets on Mistron T-076, a talc of fine particle size developed especially for the formulation of enamels, flats, lacquers, industrial finishes, varnishes and printing ink. Physical and chemical characteristics are tabulated together with the particle size distribution. Such important considerations as characteristics of this material in oil, consistency, gloss control illustrated with graphs are also given.

PROCESSING EQUIPMENT

Twenty-eight-page bulletin describes evaporators, dryers, distillation units, kettles, etc. Specialized equipment for processing equipment are also included. Request bulletin 349, issued by the Buflovak Equipment Div., Blaw-Knox Co., 1575 Fillmore Ave., Buffalo, N. Y.

EMULSIONS

Resin emulsions used to increase tack and strength of synthetic and natural rubber latices are discussed in Data Sheet No. 29 issued by the American Resinous Chemicals Corp., Peabody, Mass. Formulations are also given.

POLYAMIDE SUSPENSOID

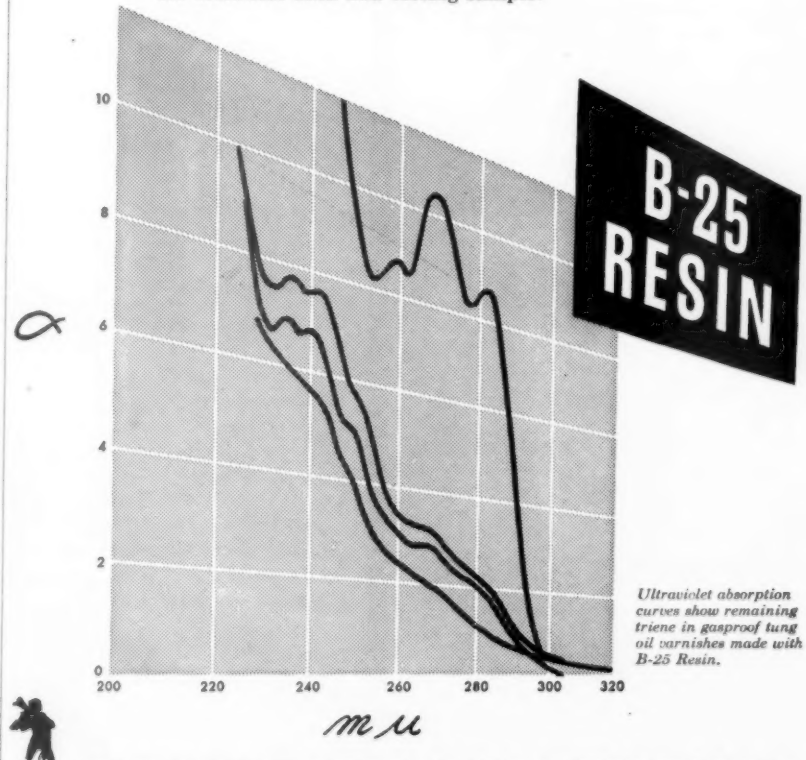
General Mills Inc., of 2010 E. Hennepin Ave., Minneapolis 13, Minn., has issued an eight-page data sheet covering the properties and suggested uses of their polyamide resin suspensoids. According to the manufacturer, these suspensoids are cationic dispersions of polyamide resin in water and are recommended as heat-sealable coatings for paper, metal foils, plastic films, cloth and leather.

LABORATORY EQUIP.

Catalog 50 contains information of apparatus and equipment for the chemical laboratory. Schaar and Co., 754 W. Lexington St., Chicago, Ill.

For Gasproof Tung Oil Varnishes

Here's a new Hercules synthetic resin to help you get the most out of tung oil. Known as B-25 Resin, it produces varnishes that are entirely free from frosting, wrinkling, or checking And this "gasproofness" can be obtained whether varnish-making schedules call for long cooking periods at low temperatures or fast cooks at moderately high heat. Send for technical data and testing sample.



Ultraviolet absorption curves show remaining triene in gasproof tung oil varnishes made with B-25 Resin.

HERCULES POWDER COMPANY, 926 Market St., Wilmington, Del. 1C50-5

COATING FORMULATION

American Cyanamid Company has announced the first seven of a new series of technical bulletins devoted exclusively to data on suggested formulations for various types of surface coatings.

A separate bulletin, punched for convenient binding, is devoted to each of these subjects: low-bake furniture finishes, baking undercoats, washing machine enamels, refrigerator enamels, heat-resistant enamels, white appliance enamels, and metal furniture enamels. Based on extensive research and evaluation in the company's Stamford, Connecticut laboratories, each bulletin contains a suggested formulation, an analysis of the finish when so formulated, recommended application procedures, and data on film properties.

Copies of any or all of these seven bulletins may be obtained from American Cyanamid Company, Coating Resins Department, 30 Rockefeller Plaza, New York 20, N. Y.

METALLIC SOAPS

Mallinckrodt Chemical Works of St. Louis, Mo. has recently published a bulletin on metallic soaps which covers properties and applications.

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A. S. T. M. Standards

Published by the American Society For Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, 1 to 9 copies $4.85 per copy: 10 to 49, $3.65 each. Members, $3.65 and $2.95.

The Seventh edition of the compilation of the A. S. T. M. Standards on Paint, Varnish, Lacquer and Related Products provides in a convenient form and right up to date each of the 190 specifications, tests, and definitions issued by the Society through the work of its Committee D-1. Every paint chemist and technologist should have a copy of this publication and all of those who produce or use paint or are concerned with it in other categories should find this compilation useful.

ALKYL PHOSPHATES

Physical properties, solvent compatibility and suggested uses for Monsanto Chemical Company's alkyl alkali and alkyl acid phosphates are contained in two technical bulletins, P-120 and P-121. Write to Monsanto Chemical Co., St. Louis, Mo.

EXTRACTION SOLVENTS

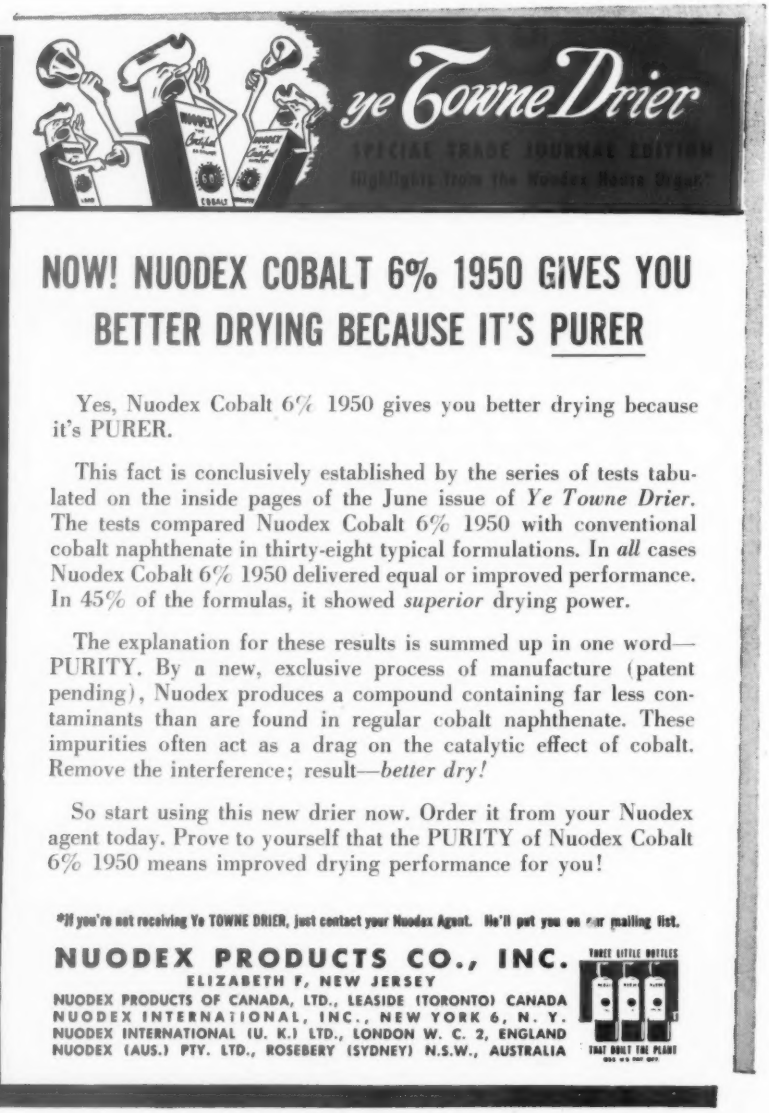
Specifications for the five common extraction solvents—pentane, isohexane, hexane, isoheptane, and heptane are covered in this bulletin recently released by the American Mineral Spirits Co., 230 N. Michigan Ave., Chicago 1, Ill.

ROTARY PUMPS

Design, construction and operation of pumps are offered in a bulletin recently issued by the Blackmer Pump Co., 230 N. Michigan Ave., Chicago, Ill. Maintenance and application are also discussed.

NATURAL RESINS

A helpful booklet on natural, fused and esterfied resins may be obtained from Joseph McNulty, 114 Liberty St., New York 6, N. Y. The booklet contains information on the various types of natural resins, their source, handling methods and test procedures. Data such as yield per unit kettle are also included.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NOW! NUODEX COBALT 6% 1950 GIVES YOU BETTER DRYING BECAUSE IT'S PURER
Yes, Nuodex Cobalt 6% 1950 gives you better drying because it's PURER.
This fact is conclusively established by the series of tests tabulated on the inside pages of the June issue of Ye Towne Drier. The tests compared Nuodex Cobalt 6% 1950 with conventional cobalt naphthenate in thirty-eight typical formulations. In all cases Nuodex Cobalt 6% 1950 delivered equal or improved performance. In 45% of the formulas, it showed superior drying power.
The explanation for these results is summed up in one word—PURITY. By a new, exclusive process of manufacture (patent pending), Nuodex produces a compound containing far less contaminants than are found in regular cobalt naphthenate. These impurities often act as a drag on the catalytic effect of cobalt. Remove the interference; result—better dry!
So start using this new drier now. Order it from your Nuodex agent today. Prove to yourself that the PURITY of Nuodex Cobalt 6% 1950 means improved drying performance for you!
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abstracts

Equipment for Making Alkyds

L. Sussmeyer, Chimie des Peintures, Vol. 13, No. 1, 71–79

The glycerophthalic resins enjoy a considerable use in the organic finishing industries, but their extended employment becomes limited by the relatively high price of manufacture. Any means which would lower the cost of manufacture and consequently, the selling price, would result in an extended use of these products.

Very many considerations govern the choice of a plant for manufacturing these resins. Plant capacity is a difficult question to solve for a new installation. On the one hand, if the plant capacity is based on existing market demands, it will soon be found too small. On the other hand, a plant capacity which is too large will be faced with excessive installation and overhead costs. The desirable objective is a combined plant of multiple use, which will serve at one and the same time, to manufacture the glycerophthalic resins, ester gums, copal esters, stand oil, modified resins, dehydrated castor oil, either under vacuum or else in an atmosphere of carbon dioxide. In this respect, the actual situation for each manufacturer will be different, but the following broad statements can be made. Manufacture of small quantities is disadvantageous from two aspects. First, the quality of the product will be inferior to that manufactured in large quantities and secondly, the operative time being the same, thus making labor costs higher.

As the minimum size equipment for commercial operation, these may be itemized as follows. For manufacturing under an atmosphere of carbon dioxide, a total capacity of 500 litres (300 kg. of dry resin). For operation under vacuum, 1,000 litres total capacity (600 kg. of dry resin). In Europe, a vessel of 2,000 litres capacity is regarded as fairly good size, while in America, a vessel of 500 gallons (2,300 litres) is the smallest size offered by plant manufacturers. Quite obviously, one of the governing factors is the size of the market available for the product.

Two procedures are actually employed in the manufacture of the alkyds—these are the fatty acid process and the monoglyceride process. The latter is by far the one most utilized. These two manufacturing processes again, can be operated by two different methods—(a) under an atmosphere of an inert gas, such as carbon dioxide or nitrogen; (b) under vacuum (600–650 mm. of mercury).

The apparatus is the same for the two processes, but different according as to whether the operation is conducted under an inert atmosphere or under a vacuum. Although from the point of view of the quality of the product, operating under an atmosphere of carbon dioxide does not give such a good grade material, nevertheless, many manufacturers are obtaining a high quality product, particularly where color is not of first importance.

From the viewpoint of variety of operation, quality and the color of the products, flexibility of operation, processing under a vacuum has many advantages to offer. The equipment however is heavier, more complicated and more expensive.

The heating is of great importance and this unit should fulfil a certain number of conditions. These comprise: considerable flexibility of regulation, either manual or automatic, optimum heat distribution over the whole of the surface to be heated in such a manner that all local superheating is avoided. This last condition is particularly important because of the bad thermal conductivity of stainless steel, one of the drawbacks of this metal. Other desirable features are low heat storage effect, maximum safety and reasonable cost. The author favors gas burners over the system of compressed gas plus air.

An interesting gas fired system is the Duoflam, originating in America which is now being adopted in Europe. This burner is characterized by a full flexibility of regulation, long flames of mushroom shape, avoiding all local superheating, and a low installation cost.

The "all or nothing" system of oil firing cannot be applied to the manufacture of resins and varnishes. The only oil burner which is suitable is the low pressure burner type. Manual fuel control regulates the air and length of flame. This type of burner can also be obtained with remote or automatic control.

Other heating methods are by electricity, either by immersion resistance heaters or else by external tubular resistance, arranged as a girdle round the vessel. Although the system of electric immersion elements has given excellent results for stand oil, it cannot be recommended for resin manufacture because of cleaning difficulties. Electric heating equipments are expensive and necessitate thermal insulation of the equipment. This renders cooling when required difficult; it is consequently, very difficult to maintain precise control of temperatures, particlarly in the case of exothermic reactions.

As regards heating by hot oil circulation, there are certain practical disadvantages. A mineral oil begins to crack, carbonize and decompose at temperatures exceeding 280° C., which rules it out of the question for heating equipment for the glycero-phthalic resins, for which certain formulations necessitate a temperature of 270° C. Dowtherm obviates this disadvantage, but the layout of the equipment becomes rather complicated and expensive. The most promising liquid heating medium is tetra aryl silicate.

The monoglyceride cooler, used in the first stage of the manufacture, should always permit the return of the condensate to the kettle for combined processing.

The phthalic anhydride condenser is used during the second stage of the process. This condenser should effectively and totally condense the excess phthalic anhydride which escapes from the vessel. This result can be obtained by the dry method or the wet method.

The processing vessel is constructed of stainless steel, the best alloy being 18% Cr, 12% Ni, 2% Mn, and 2 to 3% Mo. This is more expensive than ordinary 18/8 stainless but has a greater resistance to corrosion and good weldability. The stirring helix should be placed as near as possible to the bottom of the vessel, to avoid all risk of overheating and carbonization of the material on the bottom. Accessory equipment will be the vacuum pump and the temperature registration. The temperature is best measured by a thermo-couple pyrometer system.

Non-glossy Oils and Lacquers

Farbe und Lack, Vol. 56, No. 3, 111–112

Matt drying oils and lacquers are produced, partly by the addition of wax and partly by the addition of non-waxy matt-producing media. Detailed consideration shows that the following groups can be distinguished:

Matt oils on an oil and wax basis. Products of this nature are represented by combinations of linseed oil and wood oil-standoil with wax solutions and for exacting conditions of use, shows an insufficient hardness.

Wax Varnishes or Lacquers. Products of this type are produced by the addition of wax solutions to copal varnishes on linseed or wood oil basis. They are superior to the matt drying oils as regards hardness, but nevertheless, do not reach the tolerance of the true hard matt lacquers. A substitution of the copal lacquer which, as far as possible, should be kept on the lean side (1 part of resin product to 0.5 to 2 parts of fatty oil) by an alkyd resin, is possible; on the other hand, if other kinds of synthetic resins are used, there exists the danger of separating out, which is difficult to control.

The matt-producing effects are considerably increased by the addition of a line resin. The amount of the wax addition should be limited to about 3–6 per cent and as a maximum should amount to about 10 per cent, because if these amounts are exceeded, the finish becomes difficult to apply. As the wax product, Carnauba, Montan or Beeswax are suitable, and further, paraffin and ceresine wax can also be used, as well as some synthetic waxes.

A disadvantage of all products of this nature, is that subsequent finish of a lacquer or oil-bound paint cannot be applied, as they would not adhere.

If great hardness and good matt effect are required, then mat drying oils are prepared entirely without any wax addition.

As the matt producing medium, suitable compounds to use are aluminum hydrate, zinc palmitate, zinc stearate, Albertat 175 A (aluminum resinate, but instead of rosin, an alberton), aluminum palmitate, aluminum stearate and further also chalk, kieselguhr, kaolin, talcum, light spar, aluminum resinate etc. Aluminum preparations have the highest matt producing effect. As aluminum palmitate and aluminum stearate only swell up very slowly in double or three times the amount of their weight of turpentine oil or mineral spirits, the whole of the aluminum preparation should therefore not be added at once, but should be used only little by little when preparing the mixture. Such slow and additive swelling up is important and determines the quality of the matt oil which will be produced.

As an example of a typical matt oil (Wax varnish), the following formulation will be typical, the composition being:

> 75 kg. of tung oil, rapidly heated up to 290° C.; 75 kg. of weakly thickened, cold linseed oil, rapidly added after which the temperature falls to about 240° C. This mixture, while still warm, has the following additions added: 100 kg. of Congo copal ester and the temperature raised to 260° C., and after a short cooking, the mixture is cooled. The following mixture is then added: 100 kg. of balsam-turpentine oil and 100 kg. of mineral spirits and in this mixture there is dissolved 3 kg. of cobalt lineoleate (6% cobalt content), 10 kg. of Beeswax, Ozokerite or Carnauba wax residues, as well as 10 kg. of spermaceti are added.

A hard drying matt oil of this kind is unscratchable, it dries in 2 hours and in 4 hours it dries through. It gives a lustrous, satin-effect coating, which is resistant to weathering. The use of copal ester insures unlimited pigment compatibility. The wood oil may also be

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partially substituted by linseed oil, without any danger of deterioration in quality of the matt oil.

There are three driers which can be used successfully with Matt Oil formulations. DRIER KR (Cobalt Resinate Solution) consists of 50 kg. of rosin, 1.6 kg. of cabaltous hydrate, 65%, 1.5 kg. of calcium hydrate, 1.5 kg. of linseed oil, and 50 kg. of mineral spirits. Metal content is 1.00% cobalt.

Another drier, (Lead-Manganese Resinate Solution) is known as DRIER BMR. It consists of 50 kg. of rosin, 1 kg. of manganous hydrate, 45%, 3 kg. of litharge, 1.5 kg. of calcium hydrate, 1.5 kg. of linseed oil and 50 kg. of mineral spirits. Metal content is about 2% lead and 0.5% manganese.

A third which is a combination of KR and BMR is composed of 2 kg. of DRIER KR and 1 kg. of BMR. The metal content is about 0.67% lead, 0.67% cobalt and 0.17% manganese.

There is a wide choice of waxes for the preparation of matt oils and matt lacquers.

Vegetable waxes: Carnauba wax, raffia wax, candelilla wax, Japan wax.

Animal waxes: Chinese, Insect wax, Beeswax, Shellac wax, Lanolin.

Mineral waxes: Montan wax, Earth wax, Ozokerite, Ceresine, Paraffin I. G. wax ST and ZI.

Wax Grading by Hardness

Hard Types: Carnauba wax, medium yellow, refined carnauba wax 100% Chinese insect wax, crude montan wax and I. G. Wax grades E, CR, O and OP.

Medium-hard waxes: Shellac wax, bleached 74° C. Shellac wax, white refined Carnauba wax, Montan wax A and ST, candelilla wax.

Soft waxes: Natural and bleached Beeswax, refined Carnauba wax grade 2a.

Bonding waxes: Ceresin, Ozokerite, Crude earth wax.

Consistency waxes: (those which have a marked thickening effect in small quantities). Slab paraffin wax, extraction-paraffin wax.

Additional waxes to obtain greater hardness with soft waxes. Carnauba wax 100% refined, medium-yellow Carnauba wax, I. G. wax grades O and OP.

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Copolymerization of Drying Oils

Verfkroniek, 1950, No. 4, 99

A survey regarding styrenated oils and alkyd resins, titled "Copolymerization of Drying Oils" was given by J. H. Van der Neut at the fifth "Technical Day" on March 1 at Utrecht, Netherlands. The speaker discussed the rise of styrenated compounds in paint industry. Manufacture of these products started

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TYPE ➡	DRYING	NON-DRYING
TRADE NAME	9-11 ACIDS	P-10
CHEMICAL NATURE	9-11 LINOLEIC	RICINOLEIC
MOLECULAR WEIGHT	281	296
COLOR (G-H)	2+	10
NEUTRALIZATION VALUE	193	180
IODINE (WIJS)	150	89

APPLICATIONS

9-11 ACIDS — Alkyds, driers, in-situ varnishes, epicholohydrin bis-phenol resin reactions.

P-10 — Alkyds, cosmetics, soaps, grease making, pharmaceuticals, emulsifying agent, plasticizer for allyl starch and Zein.

Consult our Technical Service Department for further information

THE baker CASTOR OIL COMPANY

LOS ANGELES 120 BROADWAY, NEW YORK 5, N. Y. CHICAGO

in USA, when styrene became a surplus product after the end of World War II. Earlier production of a hard, styrenated phenolic resin (Styresin H) by I G Farben has been discontinued.

Mr. Van der Neut explained the various theories concerned with the forming of styrenated oils and alkyds. Kappelmeier's theory, based on the Diels-Alder reaction, is considered to give the most plausible explanation. Styrenated oils and alkyds can be manufactured in solution or by a catalytic method, which does not use solvents. In the USA copolymerization is achieved by the catalytic process. The speaker then described the theory of copolymerization by Hewitt and Armitage, who believe that the reaction takes place via a radical mechanism. This theory has been opposed by J. Rinse.

A full description of the properties of styrenated oils and alkyd resins followed. The author stressed the quick-drying of such paints, formulated with these oils and resins and mentioned his experiences in pigmentation of these coatings. In his opinion alkaline pigments like zinc oxide should not be used.

Oiticica Oil

Dr. W. Garmsen. Paper read before the General Meeting 1949 of the German Society for Fat Science

Dr. Garmsen reviews the international literature concerning the development and science of oiticica oil and its products, commencing with the first publication of A. Steger and J. van Loon in the Dutch Journal "Recueil Trav. chim. Pays-Bas, 50 (1931) pp. 936 and discussing the findings of all well-known paint technologists such as C. A. P. Kappelmeier, Brown and Farmer, Morell and Davis, Kaufmann, Funke and Fu Ying Liu, Soerensen, Schumann, Holdt, Rumyantseva, von Mikusch, etc. Like most of the other oiticica experts Dr. Garmsen is convinced that this oil should never be the only oily constituent of paint materials. Without an admixture of wood oil or linseed oil (10–25% linseed oil or 25–35% wood oil) or mixtures of both, oiticica oil form comparatively brittle films of less permanent gloss and water resistance. L. Huffmann recommends mixtures of oiticica, linseed and synourin-oils.

CALENDAR OF EVENTS

Aug. 28–30. American Soybean Association, Springfield Armory, Springfield, Ohio.

Sept. 3–8. American Chemical Society, 118th National Meeting, Chicago, Ill.

Sept. 5–9. National Chemical Exposition, Coliseum, Chicago, Ill.

Sept. 18–22. National Instrument Conference and Exposition, Buffalo, N. Y.

Sept. 26–29. Industrial Packaging & Materials Handling Exposition, Philadelphia, Pa.

Oct. 16–20. National Safety Congress, Chicago, Ill.

Oct. 18–20. Society of the Plastics Industry, New Ocean House, Swampscott, Mass.

Oct. 23–25. Packaging Institute, Annual Forum, Commodore Hotel, New York, N. Y.

Nov. 9–11. Federation of Paint and Varnish Production Clubs Convention, Congress Hotel, Chicago, Ill.

Nov. 15–18. National Paint, Varnish and Lacquer Association Convention, Fairmont Hotel, San Francisco, Calif.

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Non-Penetrating Pure Alkyd for One-Coat Flat Paints Announced by U.S.I.

AROFLAT 3025-P40, Designed to Replace Conventional Flat Paint Vehicles, Provides Outstanding Brushing Ease, Scrubability, Color Retention, Hold-Out, Flexibility, and Film Toughness

A new, non-penetrating, pure alkyd resin vehicle for one-coat flat paints, AROFLAT 3025-P40, is now in production at U.S.I. In the past, many paint manufacturers have relied on limed or calcicoater vehicles to impart non-penetrating properties to their flat paints. Paints made with these vehicles, however, have the disadvantages of unpleasant odor, lack of film toughness, inferior color retention, and poor wet scrub resistance.

The new AROFLAT 3025-P (40% solids in petroleum spirits) equals limed or calcicoater vehicles in providing non-penetration, yet has none of their disadvantages. It gives outstanding color retention, hold-out, leveling, brushing ease, flexibility, fast drying, scrubability, film toughness, pigment suspension, pigment wetting and stability.

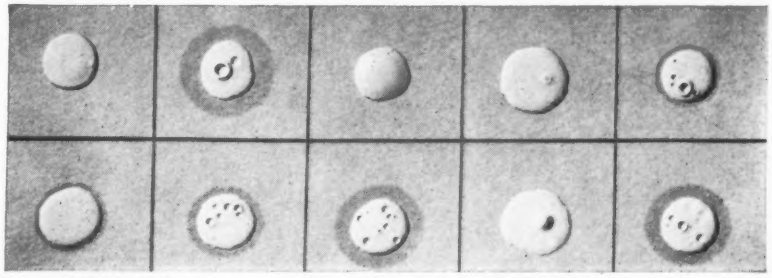
A special penetration test, employed extensively by U.S.I.'s resin laboratories, has been conducted to compare paints based solely on AROFLAT 3025-P with a large number of commercial flat paints now on the market. The illustrations show eight of these commercial products, demonstrating the range of non-penetration from good to poor. The test measures penetration in terms of time required for a specified quantity of paint placed on a blotter to show through as a stain on the reverse side. The flat paint made with AROFLAT 3025-P shows no penetration up to 2 hours after application as compared to considerably less time for one made with AROFLAT 3010, which was designed for multiple coat systems. Of the eight commercial flat paints in the test, two withstood penetration for 2 hours and two others for 1½ hours while the four remaining paints ranged from 3 minutes to 8 minutes in penetration time. Practical brush applications on unprimed surfaces have been found to give good correlation with this laboratory test method.

FIGURE I

U.S.I. Laboratory Penetration Test of Paints Based on AROFLAT vs. Commercial Flat Paint Products

Flat Paint Made With AROFLAT 3025-P40

Commercial Flat Paints Now on the Market



Flat Paint Made With AROFLAT 3010-M65

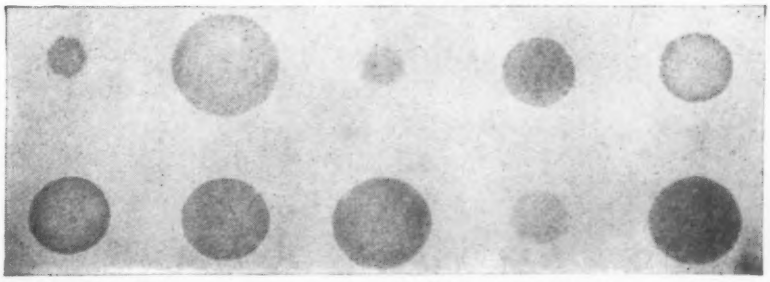
Commercial Flat Paints Now on the Market

FIGURE II

Test Made on Parker's Commercial Blotter

Flat Paint Made With AROFLAT 3025-P40

Commercial Flat Paints Now on the Market



Flat Paint Made With AROFLAT 3010-M65

Commercial Flat Paints Now on the Market

FIGURE I is an unretouched photograph taken 3 hours after application of the first paint—AROFLAT 3025-P in the upper left-hand corner. There was an elapsed time of 1 hour from the time this paint was applied until the final spot was applied in the lower right hand corner; therefore the photograph actually shows the penetration of flat paint based on AROFLAT 3025 at 3 hours, as compared to only 2 hours for the paint which was the last to be applied.

FIGURE II is an unretouched photograph of the reverse side of FIGURE I, illustrating the degree of penetration three hours after application of the first paint. The diameter of the stain measures severity of penetration and only one commercial product equals the AROFLAT 3025 type paint in this regard.

Those paints which equaled or approached the AROFLAT 3025-P paint in non-penetration were found to be markedly inferior in wet scrub resistance, ranging from 1,000 to 1,500 scrub cycles on the Gardner Wet Scrub Machine, using a 2% Kirkman soap powder solution, as compared to over 5,000 cycles for the paints based on AROFLAT 3025-P and 3010-M. In this test, resistance is measured in terms of the number of cycles required to reach the first film break-through. In addition to their lack of scrub resistance, these paints were found to be inferior in color retention, odor, adhesion, and drying properties, to those made with either AROFLAT 3025-P40 or AROFLAT 3010-M65 resin.

AROFLAT 3025-P will be available in odorless-type solvent for limited-size orders, but not for samples, dependent upon the relationship of supply of this type of solvent to the demands of the industry. This is the first time that a pure alkyd vehicle for flat wall paint has been offered in the odorless type solvent. For further information, write

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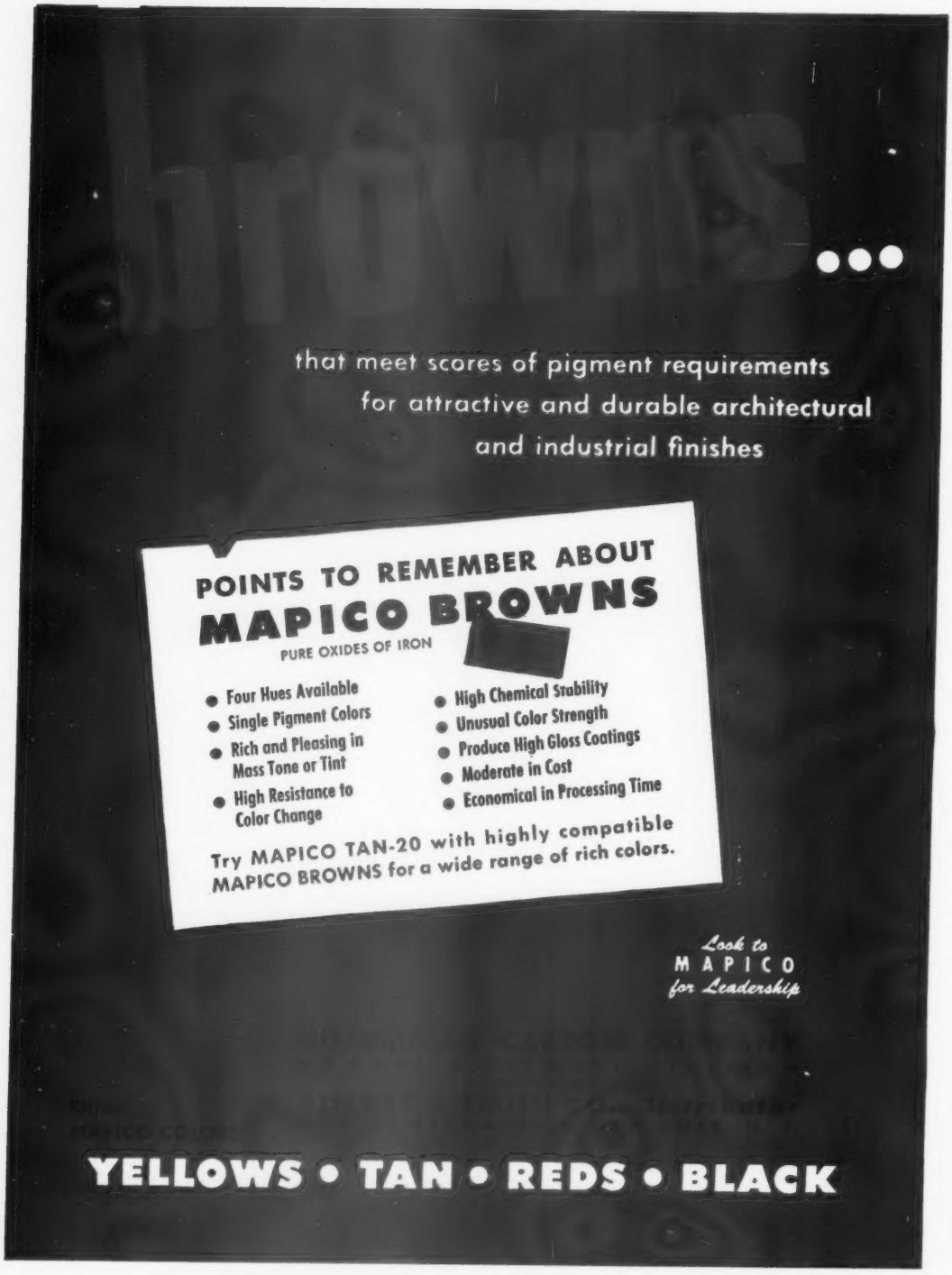
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